Supersymmetric Particle Searches

The exclusion of particle masses within a mass range (m_1, m_2) will be denoted with the notation "none $m_1 - m_2$" in the VALUE column of the following Listings. The latest unpublished results are described in the "Supersymmetry: Experiment" review.

See the related review(s):

Supersymmetry, Part I (Theory)
Supersymmetry, Part II (Experiment)

CONTENTS:

Most of the results shown below, unless stated otherwise, are based on the Minimal Supersymmetric Standard Model (MSSM), as described in the Note on Supersymmetry. Unless otherwise indicated, this includes the assumption of common gaugino and scalar masses at the scale of Grand Unification (GUT), and use of the resulting relations in the spectrum and decay branching ratios. Unless otherwise indicated, it is also assumed that R-parity (R) is conserved and that:

1) The $\widetilde{\chi}_1^0$ is the lighest supersymmetric particle (LSP)
2) $m_{\widetilde{f}_L} = m_{\widetilde{f}_R}$, where $\widetilde{f}_{L,R}$ refer to the scalar partners of left- and right-handed fermions.

Limits involving different assumptions are identified in the Comments or in the Footnotes. We summarize here the notations used in this Chapter to characterize some of the most common deviations from the MSSM (for further details, see the Note on Supersymmetry).

Theories with R-parity violation ($\not{R}$) are characterized by a superpotential of the form: $\lambda_{ijk} L_i L_j e_k^c + \lambda'_{ijk} L_i Q_j d_k^c + \lambda''_{ijk} u_i^c d_j^c d_k^c$, where i, j, k are generation indices. The presence of any of these couplings is often identified in the following by the symbols $LL\overline{E}$, $LQ\overline{D}$, and $\overline{UDD}$. Mass limits in the presence of $\not{R}$ will often refer to "direct" and "indirect" decays. Direct refers to $\not{R}$ decays of the particle in consideration. Indirect refers to cases where $\not{R}$ appears in the decays of the LSP. The LSP need not be the $\widetilde{\chi}_1^0$.

In several models, most notably in theories with so-called Gauge Mediated Supersymmetry Breaking (GMSB), the gravitino ($\widetilde{G}$) is the LSP. It is usually much lighter than any other massive particle in the spectrum, and $m_{\widetilde{G}}$ is then neglected in all decay processes involving gravitinos. In these scenarios, particles other than the neutralino are sometimes considered as the next-to-lighest supersymmetric particle (NLSP), and are assumed to decay to their even-R partner plus $\widetilde{G}$. If the lifetime is short enough for the decay to take place within the detector, $\widetilde{G}$ is assumed to be undetected and to give rise to missing energy ($\not{E}$) or missing transverse energy ($\not{E}_T$) signatures.

When needed, specific assumptions on the eigenstate content of $\widetilde{\chi}^0$ and $\widetilde{\chi}^{\pm}$ states are indicated, using the notation $\widetilde{\gamma}$ (photino), $\widetilde{H}$ (higgsino), $\widetilde{W}$ (wino), and $\widetilde{Z}$ (zino) to signal that the limit of pure states was used. The terms gaugino is also used, to generically indicate wino-like charginos and zino-like neutralinos.

In the listings we have made use of the following abbreviations for simplified models employed by the experimental collaborations in supersymmetry searches published in the past year.

WARNING: Experimental lower mass limits determined within simplified models are to be treated with extreme care as they might not be directly applicable to realistic models. This is outlined in detail in the publications and we recommend consulting them before using bounds. For example, branching ratios, typically fixed to specific values in simplified models, can vary substantially in more elaborate models.

Simplified Models Table

Tglu1A: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_1^0$.

Tglu1B: gluino pair production with $\tilde{g} \to qq'\tilde{\chi}_1^{\pm}$, $\tilde{\chi}_1^{\pm} \to W^{\pm}\tilde{\chi}_1^0$.

Tglu1C: gluino pair production with a 2/3 probability of having a $\tilde{g} \to qq'\tilde{\chi}_1^{\pm}$, $\tilde{\chi}_1^{\pm} \to W^{\pm}\tilde{\chi}_1^0$ decay and a 1/3 probability of having a $\tilde{g} \to qq\tilde{\chi}_2^0$, $\tilde{\chi}_2^0 \to Z^{\pm}\tilde{\chi}_1^0$ decay.

Tglu1D: gluino pair production with one gluino decaying to $q\bar{q}'\tilde{\chi}_1^{\pm}$ with $\tilde{\chi}_1^{\pm} \to W^{\pm} + \tilde{G}$, and the other gluino decaying to $q\bar{q}\tilde{\chi}_1^0$ with $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tglu1E: gluino pair production with $\tilde{g} \to qq'\tilde{\chi}_1^{\pm}$, $\tilde{\chi}_1^{\pm} \to W^{\pm}\tilde{\chi}_2^0$ and $\tilde{\chi}_2^0 \to Z^{\pm}\tilde{\chi}_1^0$ where $m_{\tilde{\chi}_1^{\pm}} = (m_{\tilde{g}} + m_{\tilde{\chi}_1^0})/2$, $m_{\tilde{\chi}_2^0} = (m_{\tilde{\chi}_1^{\pm}} + m_{\tilde{\chi}_1^0})/2$.

Tglu1F: gluino pair production with $\tilde{g} \to qq'\tilde{\chi}_1^{\pm}$ or $\tilde{g} \to qq\tilde{\chi}_2^0$ with equal branching ratios, where $\tilde{\chi}_1^{\pm}$ decays through an intermediate scalar tau lepton or sneutrino to $\tau\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate scalar tau lepton or sneutrino to $\tau^+\tau^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$; the mass hierarchy is such that $m_{\chi_1^\pm} \sim m_{\tilde{\chi}_2^0} = (m_{\tilde{g}} + m_{\chi_1^0})/2$ and $m_{\tilde{\tau},\tilde{\nu}} = (m_{\tilde{\chi}_1^\pm} + m_{\tilde{\chi}_1^0})/2$.

Tglu1G: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_2^0$, and $\tilde{\chi}_2^0$ decaying through an intermediate slepton or sneutrino to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$ where $m_{\tilde{\chi}_2^0} = (m_{\tilde{g}} + m_{\tilde{\chi}_1^0})/2$ and $m_{\tilde{\ell},\tilde{\nu}} = (m_{\tilde{\chi}_2^0} + m_{\tilde{\chi}_1^0})/2$.

Tglu1H: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_2^0$, and $\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 Z^{0(*)}$.

Tglu1I: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_2^0$, and $\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 H$.

Tglu1J: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_2^0$, and $\mathrm{BR}(\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 Z^{0(*)}) = \mathrm{BR}(\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 H) = 0.5$.

Tglu1LL gluino pair production where $\tilde{g} \to q\bar{q}\tilde{\chi}_1^0$ happens with 1/3 probability and $\tilde{g} \to q\bar{q}\tilde{\chi}_1^\pm$ happens with 2/3 probability. The $\tilde{\chi}_1^\pm$ is assumed to be few hundreds of MeV heavier than the $\tilde{\chi}_1^0$, and decays to $\tilde{\chi}_1^0$ via a pion.

Tglu2A: gluino pair production with $\tilde{g} \to b\bar{b}\tilde{\chi}_1^0$.

Tglu3A: gluino pair production with $\tilde{g} \to t\bar{t}\tilde{\chi}_1^0$.

Tglu3B: gluino pair production with $\tilde{g} \to t\bar{\tilde{t}}$ where $\tilde{t}$ decays exclusively to $t\tilde{\chi}_1^0$.

Tglu3C: gluino pair production with $\tilde{g} \to t\bar{\tilde{t}}$ where $\tilde{t}$ decays exclusively to $c\tilde{\chi}_1^0$.

Tglu3D: gluino pair production with $\tilde{g} \to t\bar{b}\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm\tilde{\chi}_1^0$.

Tglu3E: gluino pair production where the gluino decays 25% of the time through $\tilde{g} \to t\bar{t}\tilde{\chi}_1^0$, 25% of the time through $\tilde{g} \to b\bar{b}\tilde{\chi}_1^0$ and 50% of the time through $\tilde{g} \to t\bar{b}\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm\tilde{\chi}_1^0$

Tglu4A: gluino pair production with one gluino decaying to $q\bar{q}'\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm + \tilde{G}$, and the other gluino decaying to $q\bar{q}\tilde{\chi}_1^0$ with $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tglu4B: gluino pair production with gluinos decaying to $q\bar{q}\tilde{\chi}_1^0$ and $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tglu4C: gluino pair production with gluinos decaying to $\tilde{g} \to q\bar{q}\tilde{\chi}_1^0$ and $\tilde{\chi}_1^0 \to Z + \tilde{G}$.

Tglu4D: gluino pair production with $\tilde{g} \to q\bar{q}\tilde{\chi}_1^0$ where the $\tilde{\chi}_1^0$ decays with equal probability to $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$ or to $\tilde{\chi}_1^0 \to H + \tilde{G}$.

Tglu4E: gluino pair production with $\tilde{g} \to b\bar{b}\tilde{\chi}_1^0$ where the $\tilde{\chi}_1^0$ decays with equal probability to $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$ or to $\tilde{\chi}_1^0 \to Z + \tilde{G}$.

Tglu4F: gluino pair production with $\tilde{g} \to t\bar{t}\tilde{\chi}_1^0$ where the $\tilde{\chi}_1^0$ decays with equal probability to $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$ or to $\tilde{\chi}_1^0 \to Z + \tilde{G}$.

Tsqk1: squark pair production with $\tilde{q} \to q\tilde{\chi}_1^0$.

Tsqk1LL squark pair production where $\tilde{q} \to q\tilde{\chi}_1^0$ and $\tilde{q} \to q\tilde{\chi}_1^\pm$ each happen with 50% probability. The $\tilde{\chi}_1^\pm$ is assumed to be few hundreds of MeV heavier than the $\tilde{\chi}_1^0$, and decays to $\tilde{\chi}_1^0$ via a pion.

Tsqk2: squark pair production with $\tilde{q} \to q\tilde{\chi}_2^0$ and $\tilde{\chi}_2^0 \to Z + \tilde{\chi}_1^0$.

Tsqk3: squark pair production with $\tilde{q} \to q'\tilde{\chi}_1^\pm$, $\tilde{\chi}_1^\pm \to W^\pm\tilde{\chi}_1^0$ (like Tglu1B but for squarks)

Tsqk4: squark pair production with squarks decaying to $q\tilde{\chi}_1^0$ and $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tsqk4A: squark pair production with one squark decaying to $q\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm + \tilde{G}$, and the other squark decaying to $q\tilde{\chi}_1^0$ with $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tsqk4B: squark pair production with squarks decaying to $q\tilde{\chi}_1^0$ and $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$.

Tstop1: stop pair production with $\tilde{t} \to t\tilde{\chi}_1^0$.

Tstop1LL stop pair production where $\tilde{t} \to t\tilde{\chi}_1^0$ and $\tilde{t} \to b\tilde{\chi}_1^\pm$ each happen with 50% probability. The $\tilde{\chi}_1^\pm$ is assumed to be few hundreds of MeV heavier than the $\tilde{\chi}_1^0$, and decays to $\tilde{\chi}_1^0$ via a pion.

Tstop2: stop pair production with $\tilde{t} \to b\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm\tilde{\chi}_1^0$.

Tstop3: stop pair production with the subsequent four-body decay $\tilde{t} \to bff'\tilde{\chi}_1^0$ where f represents a lepton or a quark.

Tstop4: stop pair production with $\tilde{t} \to c\tilde{\chi}_1^0$.

Tstop5: stop pair production with $\tilde{t} \to b\bar{\nu}\tilde{\tau}$ with $\tilde{\tau} \to \tau\tilde{G}$.

Tstop6: stop pair production with $\tilde{t} \to t + \tilde{\chi}_2^0$, where $\tilde{\chi}_2^0 \to Z + \tilde{\chi}_1^0$ or $H + \tilde{\chi}_1^0$ each with Br=50%.

Tstop7: stop pair production with $\tilde{t}_2 \to \tilde{t}_1 + H/Z$, where $\tilde{t}_1 \to t + \tilde{\chi}_1^0$.

Tstop8: stop pair production with equal probability of the stop decaying via $\tilde{t} \to t\tilde{\chi}_1^0$ or via $\tilde{t} \to b\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm \to W^\pm\tilde{\chi}_1^0$.

Tstop9: stop pair production with equal probability of the stop decaying via $\tilde{t} \to c\tilde{\chi}_1^0$ or via the four-body decay $\tilde{t} \to bff'\tilde{\chi}_1^0$ where f represents a lepton or a quark.

Tstop10: stop pair production with $\tilde{t} \to b\tilde{\chi}_1^\pm$ and $\tilde{\chi}_1^\pm \to W^{\pm *}\tilde{\chi}_1^0 \to (f\bar{f}') + \tilde{\chi}_1^0$ with a virtual W-boson.

Tstop11: stop pair production with $\tilde{t} \to b\tilde{\chi}_1^\pm$ with $\tilde{\chi}_1^\pm$ decaying through an intermediate slepton to $l\nu\tilde{\chi}_1^0$

Tstop12: stop pair production with $\tilde{t} \to t\tilde{\chi}_1^0$ and $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$

Tstop13: stop pair production with $\tilde{t} \to t\tilde{\chi}_1^0$ where the $\tilde{\chi}_1^0$ can decay with equal probability to $\tilde{\chi}_1^0 \to \gamma + \tilde{G}$ or to $\tilde{\chi}_1^0 \to Z + \tilde{G}$.

Tstop1RPV: stop pair production with $\tilde{t} \to \bar{b}\bar{s}$ via RPV coupling λ''_{323}.

Tstop2RPV: stop pair production with $\tilde{t} \to b\ell$, via RPV coupling λ'_{i33}.

Tstop3RPV: stop pair production with $\tilde{t} \to q\mu$, via RPV coupling λ'_{23k}.

Tstop4RPV: stop pair production with $\tilde{t} \to b\tilde{\chi}_1^\pm$, $\tilde{\chi}_1^\pm \to bbs$ via RPV coupling λ''_{323}.

Tstop5RPV: stop pair production with $\tilde{t} \to t\tilde{\chi}^0_{1,2}$, $\tilde{\chi}^0_{1,2} \to tbs$ via RPV coupling λ''_{323}.

Tsbot1: sbottom pair production with $\tilde{b} \to b\tilde{\chi}^0_1$.

Tsbot2: sbottom pair production with $\tilde{b} \to t\chi^-_1$, $\chi^-_1 \to W^-\tilde{\chi}^0_1$.

Tsbot3: sbottom pair production with $\tilde{b} \to b\tilde{\chi}^0_2$, where one of the $\tilde{\chi}^0_2 \to Z^{(*)}\tilde{\chi}^0_1 \to f\bar{f}\tilde{\chi}^0_1$ and the other $\tilde{\chi}^0_2 \to \tilde{\ell}\ell^+ \to \ell^+\ell^-\tilde{\chi}^0_1$.

Tsbot4: sbottom pair production with $\tilde{b} \to b\tilde{\chi}^0_2$, with $\tilde{\chi}^0_2 \to H\tilde{\chi}^0_1$

Tchi1chi1A: electroweak pair and associated production of nearly mass-degenerate charginos $\tilde{\chi}^\pm_1$ and neutralinos $\tilde{\chi}^0_1$, where $\tilde{\chi}^\pm_1$ decays to $\tilde{\chi}^0_1$ plus soft radiation, and where one of the $\tilde{\chi}^0_1$ decays to $\gamma + \tilde{G}$ while the other one decays to $Z/H + \tilde{G}$ (with equal probability).

Tchi1chi1B: electroweak pair production of charginos $\tilde{\chi}^\pm_1$, where $\tilde{\chi}^\pm_1$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}^0_1$ and where the slepton or sneutrino mass is 5%, 25%, 50%, 75% and 95% of the $\tilde{\chi}^\pm_1$ mass.

Tchi1chi1C: electroweak pair production of charginos $\tilde{\chi}^\pm_1$, where $\tilde{\chi}^\pm_1$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}^0_1$ and where $m_{\tilde{\ell},\tilde{\nu}} = (m_{\tilde{\chi}^\pm_1} + m_{\tilde{\chi}^0_1})/2$.

Tchi1chi1D: electroweak associated pair production of charginos $\tilde{\chi}^\pm_1$, where $\tilde{\chi}^\pm_1$ decays through an intermediate scalar tau lepton or sneutrino to $\tau\nu\tilde{\chi}^0_1$ and where $m_{\tilde{\tau}}, m_{\tilde{\nu}} = (m_{\tilde{\chi}^\pm_1} + m_{\tilde{\chi}^0_1})/2$.

Tchi1chi1F: electroweak pair and associated production of nearly mass-degenerate charginos $\tilde{\chi}^\pm_1$ and neutralinos $\tilde{\chi}^0_1$ (*i.e.* $\tilde{\chi}^\pm_1\tilde{\chi}^\pm_1$ and $\tilde{\chi}^\pm_1\tilde{\chi}^0_1$ production) where the $\tilde{\chi}^\pm_1$ decays exclusively to $\tilde{\chi}^0_1$ plus soft radiation and the $\tilde{\chi}^0_1$ decays to $\gamma/Z + \tilde{G}$.

Tchi1chi1G: electroweak pair production of charginos $\tilde{\chi}^\pm_1$, which are nearly mass-degenerate with neutralinos $\tilde{\chi}^0_1$. The $\tilde{\chi}^\pm_1$ decays either to $W^\pm + \tilde{G}$, or to $\tilde{\chi}^0_1$ plus soft radiation. The $\tilde{\chi}^0_1$ decays exclusively to $\gamma + \tilde{G}$.

Tchi1chi1H: electroweak pair production of charginos $\tilde{\chi}^\pm_1$, with $\tilde{\chi}^\pm_1 \to W^\pm + \tilde{\chi}^0_1$ and $W^\pm \to \ell^\pm + \nu$.

Tchi1n1A: electroweak associated production of mass-degenerate charginos $\tilde{\chi}^\pm_1$ and neutralinos $\tilde{\chi}^0_1$, where $\tilde{\chi}^\pm_1$ decays exclusively to $W^\pm + \tilde{G}$ and $\tilde{\chi}^0_1$ decays exclusively to $\gamma + \tilde{G}$.

Tchi1n2A: electroweak associated production of mass-degenerate charginos $\tilde{\chi}^\pm_1$ and neutralinos $\tilde{\chi}^0_2$, where $\tilde{\chi}^\pm_1$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}^0_1$ and where $\tilde{\chi}^0_2$ decays through an intermediate slepton or sneutrino to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$.

Tchi1n2B: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate slepton or sneutrino to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$ and where the slepton or sneutrino mass is 5%, 25%, 50%, 75% and 95% of the $\tilde{\chi}_1^\pm$ mass.

Tchi1n2C: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate slepton or sneutrino to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$ and where $m_{\tilde{\ell},\tilde{\nu}} = (m_{\tilde{\chi}_1^\pm} + m_{\tilde{\chi}_1^0})/2$.

Tchi1n2D: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate scalar tau lepton or sneutrino to $\tau\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate scalar tau lepton or sneutrino to $\tau^+\tau^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$ and where $m_{\tilde{\tau},\tilde{\nu}} = (m_{\tilde{\chi}_1^\pm} + m_{\tilde{\chi}_1^0})/2$.

Tchi1n2E: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm \to W^\pm + \tilde{\chi}_1^0$ and $\tilde{\chi}_2^0 \to H + \tilde{\chi}_1^0$.

Tchi1n2F: electroweak associated production of mass-degenerate wino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate $W^{\pm *}$ to $l\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate Z^* to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$.

Tchi1n2Fa: electroweak associated production of mass-degenerate wino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate $W^{\pm *}$ to $q\bar{q}\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate Z^* to $l^+l^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$.

Tchi1n2G: electroweak associated production of Higgsino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, and electroweak associated production of $\tilde{\chi}_2^0$ and $\tilde{\chi}_1^0$, where $m_{\tilde{\chi}_1^\pm} = (m_{\tilde{\chi}_2^0} + m_{\tilde{\chi}_1^0})/2$ and where $\tilde{\chi}_1^\pm$ decays through an intermediate $W^{\pm *}$ to $q\bar{q}\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate Z^* to $l^+l^-\tilde{\chi}_1^0$.

Tchi1n2Ga: electroweak associated production of Higgsino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, and electroweak associated production of $\tilde{\chi}_2^0$ and $\tilde{\chi}_1^0$, where $m_{\tilde{\chi}_1^\pm} = (m_{\tilde{\chi}_2^0} + m_{\tilde{\chi}_1^0})/2$ and where $\tilde{\chi}_1^\pm$ decays through an intermediate $W^{\pm *}$ to $l\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays through an intermediate Z^* to $l^+l^-\tilde{\chi}_1^0$.

Tchi1n2H: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays through an intermediate slepton or sneutrino to $l\nu\tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$

decays through an intermediate scalar tau lepton or sneutrino to $\tau^+\tau^-\tilde{\chi}_1^0$ or $\nu\bar{\nu}\tilde{\chi}_1^0$.

Tchi1n2I: electroweak associated production of mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ decays to $W^\pm + \tilde{\chi}_1^0$ and where $\tilde{\chi}_2^0$ decays 50% of the time to $Z + \tilde{\chi}_1^0$ and 50% of the time to $H + \tilde{\chi}_1^0$.

Tchi1n12_GGM: in the framework of General Gauge Mediation (GGM): electroweak pair and associated production of nearly mass-degenerate charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_1^0$, $\tilde{\chi}_2^0$ (*i.e.* $\tilde{\chi}_1^\pm\tilde{\chi}_1^\pm$, $\tilde{\chi}_1^\pm\tilde{\chi}_1^0$ and $\tilde{\chi}_1^\pm\tilde{\chi}_2^0$ production) where the $\tilde{\chi}_1^\pm$ decays exclusively to $W^\pm + \tilde{G}$, the $\tilde{\chi}_2^0$ decays to $Z/H + \tilde{G}$ and the $\tilde{\chi}_1^0$ decays to $\gamma/Z + \tilde{G}$. The branching ratios depend on the composition of the gauge eigenstates of the neutralinos in the GGM scenario.

Tn1n1A: electroweak pair and associated production of nearly mass-degenerate Higgsino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_1^0$ and $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ and $\tilde{\chi}_2^0$ decay to $\tilde{\chi}_1^0$ plus soft radiation and where both of the $\tilde{\chi}_1^0$ decay to $H + \tilde{G}$.

Tn1n1B: electroweak pair and associated production of nearly mass-degenerate Higgsino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_1^0$ and $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ and $\tilde{\chi}_2^0$ decay to $\tilde{\chi}_1^0$ plus soft radiation and where the $\tilde{\chi}_1^0$ decays 50% of the time to $H + \tilde{G}$ and 50 % of the time to $Z + \tilde{G}$.

Tn1n1C: electroweak pair and associated production of nearly mass-degenerate Higgsino-like charginos $\tilde{\chi}_1^\pm$ and neutralinos $\tilde{\chi}_1^0$ and $\tilde{\chi}_2^0$, where $\tilde{\chi}_1^\pm$ and $\tilde{\chi}_2^0$ decay to $\tilde{\chi}_1^0$ plus soft radiation and where both of the $\tilde{\chi}_1^0$ decay to $Z + \tilde{G}$.

Tn2n3A: electroweak associated production of mass-degenerate neutralinos $\tilde{\chi}_2^0$ and $\tilde{\chi}_3^0$, where $\tilde{\chi}_2^0$ and $\tilde{\chi}_3^0$ decay through intermediate sleptons to $l^+l^-\tilde{\chi}_1^0$ and where the slepton mass is 5%, 25%, 50%, 75% and 95% of the $\tilde{\chi}_2^0$ mass.

Tn2n3B: electroweak associated production of mass-degenerate neutralinos $\tilde{\chi}_2^0$ and $\tilde{\chi}_3^0$, where $\tilde{\chi}_2^0$ and $\tilde{\chi}_3^0$ decay through intermediate sleptons to $l^+l^-\tilde{\chi}_1^0$ and where $m_{\tilde{\ell}} = (m_{\tilde{\chi}_2^0} + m_{\tilde{\chi}_1^0})/2$.

$\tilde{\chi}_1^0$ (Lightest Neutralino) mass limit

$\tilde{\chi}_1^0$ is often assumed to be the lightest supersymmetric particle (LSP). See also the $\tilde{\chi}_2^0$, $\tilde{\chi}_3^0$, $\tilde{\chi}_4^0$ section below.

We have divided the $\tilde{\chi}_1^0$ listings below into five sections:

1) Accelerator limits for stable $\tilde{\chi}_1^0$,

2) Bounds on $\tilde{\chi}_1^0$ from dark matter searches,

3) $\widetilde{\chi}_1^0 - p$ elastic cross section (spin-dependent, spin-independent interactions),
4) Other bounds on $\widetilde{\chi}_1^0$ from astrophysics and cosmology, and
5) Unstable $\widetilde{\chi}_1^0$ (Lightest Neutralino) mass limit.

Accelerator limits for stable $\widetilde{\chi}_1^0$

Unless otherwise stated, results in this section assume spectra, production rates, decay modes, and branching ratios as evaluated in the MSSM, with gaugino and sfermion mass unification at the GUT scale. These papers generally study production of $\widetilde{\chi}_i^0 \widetilde{\chi}_j^0$ ($i \geq 1$, $j \geq 2$), $\widetilde{\chi}_1^+ \widetilde{\chi}_1^-$, and (in the case of hadronic collisions) $\widetilde{\chi}_1^+ \widetilde{\chi}_2^0$ pairs. The mass limits on $\widetilde{\chi}_1^0$ are either direct, or follow indirectly from the constraints set by the non-observation of $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$ states on the gaugino and higgsino MSSM parameters M_2 and μ. In some cases, information is used from the nonobservation of slepton decays.

Obsolete limits obtained from $e^+ e^-$ collisions up to $\sqrt{s}$=184 GeV have been removed from this compilation and can be found in the 2000 Edition (The European Physical Journal **C15** 1 (2000)) of this Review. $\Delta m = m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$.

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
		[1] DREINER	09	THEO	
>40	95	[2] ABBIENDI	04H	OPAL	all $\tan\beta$, Δm >5 GeV, m_0 >500 GeV, $A_0 = 0$
>42.4	95	[3] HEISTER	04	ALEP	all $\tan\beta$, all Δm, all m_0
>39.2	95	[4] ABDALLAH	03M	DLPH	all $\tan\beta$, $m_{\widetilde{\nu}}$ >500 GeV
>46	95	[5] ABDALLAH	03M	DLPH	all $\tan\beta$, all Δm, all m_0
>32.5	95	[6] ACCIARRI	00D	L3	$\tan\beta > 0.7$, $\Delta m > 3$ GeV, all m_0
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[7] AAD	14K	ATLS	
>24		[8] CALIBBI	13		thermal relic abundance, MSSM particle content

[1] DREINER 09 show that in the general MSSM with non-universal gaugino masses there exists no model-independent laboratory bound on the mass of the lightest neutralino. An essentially massless χ_1^0 is allowed by the experimental and observational data, imposing some constraints on other MSSM parameters, including M_2, μ and the slepton and squark masses.

[2] ABBIENDI 04H search for charginos and neutralinos in events with acoplanar leptons+jets and multi-jet final states in the 192–209 GeV data, combined with the results on leptonic final states from ABBIENDI 04. The results hold for a scan over the parameter space covering the region $0 < M_2 <$5000 GeV, $-1000 < \mu <$1000 GeV and $\tan\beta$ from 1 to 40. This limit supersedes ABBIENDI 00H.

[3] HEISTER 04 data collected up to 209 GeV. Updates earlier analysis of selectrons from HEISTER 02E, includes a new analysis of charginos and neutralinos decaying into stau and uses results on charginos with initial state radiation from HEISTER 02J. The limit is based on the direct search for charginos and neutralinos, the constraints from the slepton search and the Higgs mass limits from HEISTER 02 using a top mass of 175 GeV, interpreted in a framework with universal gaugino and sfermion masses. Assuming the mixing in the stau sector to be negligible, the limit improves to 43.1 GeV. Under the

assumption of MSUGRA with unification of the Higgs and sfermion masses, the limit improves to 50 GeV, and reaches 53 GeV for $A_0 = 0$. These limits include and update the results of BARATE 01.

[4] ABDALLAH 03M uses data from $\sqrt{s} = 192$–208 GeV. A limit on the mass of $\widetilde{\chi}^0_1$ is derived from direct searches for neutralinos combined with the chargino search. Neutralinos are searched in the production of $\widetilde{\chi}^0_1\widetilde{\chi}^0_2$, $\widetilde{\chi}^0_1\widetilde{\chi}^0_3$, as well as $\widetilde{\chi}^0_2\widetilde{\chi}^0_3$ and $\widetilde{\chi}^0_2\widetilde{\chi}^0_4$ giving rise to cascade decays, and $\widetilde{\chi}^0_1\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_1\widetilde{\chi}^0_2$, followed by the decay $\widetilde{\chi}^0_2 \rightarrow \widetilde{\tau}\tau$. The results hold for the parameter space defined by values of $M_2 < 1$ TeV, $|\mu| \leq 2$ TeV with the $\widetilde{\chi}^0_1$ as LSP. The limit is obtained for $\tan\beta = 1$ and large m_0, where $\widetilde{\chi}^0_2\widetilde{\chi}^0_4$ and chargino pair production are important. If the constraint from Higgs searches is also imposed, the limit improves to 49.0 GeV in the m_h^{max} scenario with m_t=174.3 GeV. These limits update the results of ABREU 00J.

[5] ABDALLAH 03M uses data from $\sqrt{s} = 192$–208 GeV. An indirect limit on the mass of $\widetilde{\chi}^0_1$ is derived by constraining the MSSM parameter space by the results from direct searches for neutralinos (including cascade decays and $\widetilde{\tau}\tau$ final states), for charginos (for all Δm_+) and for sleptons, stop and sbottom. The results hold for the full parameter space defined by values of $M_2 < 1$ TeV, $|\mu| \leq 2$ TeV with the $\widetilde{\chi}^0_1$ as LSP. Constraints from the Higgs search in the m_h^{max} scenario assuming m_t=174.3 GeV are included. The limit is obtained for $\tan\beta \geq 5$ when stau mixing leads to mass degeneracy between $\widetilde{\tau}_1$ and $\widetilde{\chi}^0_1$ and the limit is based on $\widetilde{\chi}^0_2$ production followed by its decay to $\widetilde{\tau}_1\tau$. In the pathological scenario where m_0 and $|\mu|$ are large, so that the $\widetilde{\chi}^0_2$ production cross section is negligible, and where there is mixing in the stau sector but not in stop nor sbottom, the limit is based on charginos with soft decay products and an ISR photon. The limit then degrades to 39 GeV. See Figs. 40–42 for the dependence of the limit on $\tan\beta$ and $m_{\widetilde{\nu}}$. These limits update the results of ABREU 00W.

[6] ACCIARRI 00D data collected at $\sqrt{s}$=189 GeV. The results hold over the full parameter space defined by $0.7 \leq \tan\beta \leq 60$, $0 \leq M_2 \leq 2$ TeV, $m_0 \leq 500$ GeV, $|\mu| \leq 2$ TeV The minimum mass limit is reached for $\tan\beta$=1 and large m_0. The results of slepton searches from ACCIARRI 99W are used to help set constraints in the region of small m_0. The limit improves to 48 GeV for $m_0 \gtrsim 200$ GeV and $\tan\beta \gtrsim 10$. See their Figs. 6–8 for the $\tan\beta$ and m_0 dependence of the limits. Updates ACCIARRI 98F.

[7] AAD 14K sets limits on the χ-nucleon spin-dependent and spin-independent cross sections out to $m_\chi = 10$ TeV.

[8] CALIBBI 13 use the fact that if the relic abundance of $\widetilde{\chi}^0_1$ does not overclose the universe, scalar lepton and Higgsino masses must be relatively small. Using 8 TeV ATLAS constraints on the scalar tau mass and on invisible Higgs decays, they estimate a lower bound for the $\widetilde{\chi}^0_1$ mass.

Bounds on $\widetilde{\chi}^0_1$ from dark matter searches

These papers generally exclude regions in the $M_2-\mu$ parameter plane assuming that $\widetilde{\chi}^0_1$ is the dominant form of dark matter in the galactic halo. These limits are based on the lack of detection in laboratory experiments, telescopes, or by the absence of a signal in underground neutrino detectors. The latter signal is expected if $\widetilde{\chi}^0_1$ accumulates in the Sun or the Earth and annihilates into high-energy ν's.

VALUE	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •			
	[1] ABAZAJIAN	20	FLAT

	[2] ABDALLAH	20	HESS
	[3] ABE	20G	SKAM
	[4] ALBERT	20	HAWC
	[5] ALBERT	20A	ANTR
	[6] ALBERT	20C	ANIC
	[7] ALVAREZ	20	FLAT
	[8] HOOF	20	FLAT
	[9] DI-MAURO	19	FLAT
	[10] JOHNSON	19	FLAT
	[11] LI	19D	FLAT
	[12] ABDALLAH	18	HESS
	[13] AHNEN	18	MGIC
	[14] ALBERT	18B	HAWC
	[15] ALBERT	18C	HAWC
	[16] AARTSEN	17	ICCB
	[17] AARTSEN	17A	ICCB
	[18] AARTSEN	17C	ICCB
	[19] ARCHAMBAU...	17	VRTS
	[20] ADRIAN-MAR...	16	ANTR
	[21] AHNEN	16	MGFL
	[22] AVRORIN	16	BAIK
	[23] CIRELLI	16	THEO
	[23] LEITE	16	THEO
	[24] ACKERMANN	15	FLAT
	[25] ACKERMANN	15A	FLAT
	[26] ACKERMANN	15B	FLAT
	[27] BUCKLEY	15	THEO
	[28] CHOI	15	SKAM
	[29] ALEKSIC	14	MGIC
	[30] AVRORIN	14	BAIK
	[31] AARTSEN	13C	ICCB
	[32] BERGSTROM	13	COSM
	[33] BOLIEV	13	BAKS
	[32] JIN	13	ASTR
	[32] KOPP	13	COSM
	[34] ACKERMANN	10	FLAT
	[35] ACHTERBERG	06	AMND
	[36] ACKERMANN	06	AMND
	[37] DEBOER	06	RVUE
	[38] DESAI	04	SKAM
	[38] AMBROSIO	99	MCRO
	[39] LOSECCO	95	RVUE
	[40] MORI	93	KAMI
	[41] BOTTINO	92	COSM
	[42] BOTTINO	91	RVUE
	[43] GELMINI	91	COSM
	[44] KAMIONKOW...	91	RVUE
	[45] MORI	91B	KAMI
none 4–15 GeV	[46] OLIVE	88	COSM

[1] ABAZAJIAN 20 sets constraints on the dark matter annihilation from gamma-ray searches from Fermi LAT observations of the Galactic center.

[2] ABDALLAH 20 places constraints on the dark matter annihilation cross section for annihilations into gamma-rays from Milky Way dwarf galaxy satellites for masses between 0.2 to 40 TeV.

[3] ABE 20G is based on SuperKamiokande data taken from 1996 to 2016 searching for neutrinos produced from dark matter annihilations in the galactic center or halo. They place constraints on the dark matter-nucleon scattering cross section for dark matter masses between 1 GeV and 10 TeV.

[4] ALBERT 20 sets limits on the annihilation cross section of dark matter with mass between 1 and 100 TeV from gamma-ray observations of the local dwarf spheroidal galaxies.

[5] ALBERT 20A set limits on the dark matter annihilation cross section from neutrinos observations in the Galactic center using 11 years of ANTARES data.

[6] ALBERT 20C set limits on the dark matter annihilation cross section from neutrinos observations in the Galactic center combining Antares and IceCube data.

[7] ALVAREZ 20 set limits on the dark matter annihilation from gamma-ray searches from Fermi LAT observations in the directions of dwarf spheroidal galaxies.

[8] HOOF 20 set limits on the dark matter annihilation from gamma-ray searches from Fermi LAT observations in the directions of dwarf spheroidal galaxies.

[9] DI-MAURO 19 sets limits on the dark matter annihilation from gamma-ray searches in M31 and M33 galaxies using Fermi LAT data.

[10] JOHNSON 19 sets limits on p-wave dark matter annihilations in the galactic center using Fermi data.

[11] LI 19D sets limits on dark matter annihilation cross sections searching for line-like signals in the all-sky Fermi data.

[12] ABDALLAH 18 places constraints on the dark matter annihilation cross section for annihilations into gamma-rays in the Galactic center for masses between 300 GeV to 70 TeV. This updates ABDALLAH 16.

[13] AHNEN 18 uses observations of the dwarf satellite galaxy Ursa Major II to obtain upper limits on annihilation cross sections for dark matter in various channels for masses between 0.1–100 TeV.

[14] ALBERT 18B sets limits on the annihilation cross section of dark matter with mass between 1 and 100 TeV from gamma-ray observations of the Andromeda galaxy.

[15] ALBERT 18C sets limits on the spin-dependent coupling of dark matter to protons from dark matter annihilation in the Sun.

[16] AARTSEN 17 is based on data collected during 327 days of detector livetime with IceCube. They looked for interactions of ν's resulting from neutralino annihilations in the Earth over a background of atmospheric neutrinos and set 90% CL limits on the spin independent neutralino-proton cross section for neutralino masses in the range 10–10000 GeV.

[17] AARTSEN 17A is based on data collected during 532 days of livetime with the IceCube 86-string detector including the DeepCore sub-array. They looked for interactions of ν's from neutralino annihilations in the Sun over a background of atmospheric neutrinos and set 90% CL limits on the spin dependent neutralino-proton cross section for neutralino masses in the range 10–10000 GeV. This updates AARTSEN 16C.

[18] AARTSEN 17C is based on 1005 days of running with the IceCube detector. They set a limit on the annihilation cross section for dark matter with masses between 10–1000 GeV annihilating in the Galactic center assuming an NFW profile. The limit is of 1.2×10^{23} cm^{3}s^{-1} in the $\tau^+ \tau^-$ channel. Supercedes AARTSEN 15E.

[19] ARCHAMBAULT 17 performs a joint statistical analysis of four dwarf galaxies with VERITAS looking for gamma-ray emission from neutralino annihilation. They set limits on the neutralino annihilation cross section.

[20] ADRIAN-MARTINEZ 16 is based on data from the ANTARES neutrino telescope. They looked for interactions of ν's from neutralino annihilations in the Sun over a background of atmospheric neutrinos and set 90% CL limits on the muon neutrino flux. They also obtain limits on the spin dependent and spin independent neutralino-proton cross section for neutralino masses in the range 50 to 5,000 GeV. This updates ADRIAN-MARTINEZ 13.

[21] AHNEN 16 combines 158 hours of Segue 1 observations with MAGIC with 6 year observations of 15 dwarf satellite galaxies by Fermi-LAT to set limits on annihilation cross sections for dark matter masses between 10 GeV and 100 TeV.

[22] AVRORIN 16 is based on 2.76 years with Lake Baikal neutrino telescope. They derive 90% upper limits on the annihilation cross section from dark matter annihilations in the Galactic center.

[23] CIRELLI 16 and LEITE 16 derive bounds on the annihilation cross section from radio observations.

[24] ACKERMANN 15 is based on 5.8 years of data with Fermi-LAT and search for monochromatic gamma-rays in the energy range of 0.2–500 GeV from dark matter annihilations. This updates ACKERMANN 13A.

[25] ACKERMANN 15A is based on 50 months of data with Fermi-LAT and search for dark matter annihilation signals in the isotropic gamma-ray background as well as galactic subhalos in the energy range of a few GeV to a few tens of TeV.

[26] ACKERMANN 15B is based on 6 years of data with Fermi-LAT observations of Milky Way dwarf spheroidal galaxies. Set limits on the annihilation cross section from $m_\chi =$ 2 GeV to 10 TeV. This updates ACKERMANN 14.

[27] BUCKLEY 15 is based on 5 years of Fermi-LAT data searching for dark matter annihilation signals from Large Magellanic Cloud.

[28] CHOI 15 is based on 3903 days of SuperKamiokande data searching for neutrinos produced from dark matter annihilations in the sun. They place constraints on the dark matter-nucleon scattering cross section for dark matter masses between 4–200 GeV.

[29] ALEKSIC 14 is based on almost 160 hours of observations of Segue 1 satellite dwarf galaxy using the MAGIC telescopes between 2011 and 2013. Sets limits on the annihilation cross section out to $m_\chi = 10$ TeV.

[30] AVRORIN 14 is based on almost 2.76 years with Lake Baikal neutrino telescope. They derive 90% upper limits on the fluxes of muons and muon neutrinos from dark matter annihilations in the Sun.

[31] AARTSEN 13C is based on data collected during 339.8 effective days with the IceCube 59-string detector. They looked for interactions of ν_μ's from neutralino annihilations in nearby galaxies and galaxy clusters. They obtain limits on the neutralino annihilation cross section for neutralino masses in the range 30–100, 000 GeV.

[32] BERGSTROM 13, JIN 13, and KOPP 13 derive limits on the mass and annihilation cross section using AMS-02 data. JIN 13 also sets a limit on the lifetime of the dark matter particle.

[33] BOLIEV 13 is based on data collected during 24.12 years of live time with the Bakson Underground Scintillator Telescope. They looked for interactions of ν_μ's from neutralino annihilations in the Sun over a background of atmospheric neutrinos and set 90% CL limits on the muon flux. They also obtain limits on the spin dependent and spin independent neutralino-proton cross section for neutralino masses in the range 10–1000 GeV.

[34] ACKERMANN 10 place upper limits on the annihilation cross section with $b\overline{b}$ or $\mu^+\mu^-$ final states.

[35] ACHTERBERG 06 is based on data collected during 421.9 effective days with the AMANDA detector. They looked for interactions of ν_μs from the centre of the Earth over a background of atmospheric neutrinos and set 90 % CL limits on the muon flux. Their limit is compared with the muon flux expected from neutralino annihilations into W^+W^- and $b\overline{b}$ at the centre of the Earth for MSSM parameters compatible with the relic dark matter density, see their Fig. 7.

[36] ACKERMANN 06 is based on data collected during 143.7 days with the AMANDA-II detector. They looked for interactions of ν_μs from the Sun over a background of atmospheric neutrinos and set 90 % CL limits on the muon flux. Their limit is compared with the muon flux expected from neutralino annihilations into W^+W^- in the Sun for SUSY model parameters compatible with the relic dark matter density, see their Fig. 3.

[37] DEBOER 06 interpret an excess of diffuse Galactic gamma rays observed with the EGRET satellite as originating from π^0 decays from the annihilation of neutralinos into quark jets. They analyze the corresponding parameter space in a supergravity inspired MSSM model with radiative electroweak symmetry breaking, see their Fig. 3 for the preferred region in the (m_0, $m_{1/2}$) plane of a scenario with large tanβ.

[38] AMBROSIO 99 and DESAI 04 set new neutrino flux limits which can be used to limit the parameter space in supersymmetric models based on neutralino annihilation in the Sun and the Earth.

[39] LOSECCO 95 reanalyzed the IMB data and places lower limit on $m_{\widetilde{\chi}^0_1}$ of 18 GeV if the LSP is a photino and 10 GeV if the LSP is a higgsino based on LSP annihilation in the sun producing high-energy neutrinos and the limits on neutrino fluxes from the IMB detector.

[40] MORI 93 excludes some region in M_2–μ parameter space depending on tanβ and lightest scalar Higgs mass for neutralino dark matter $m_{\widetilde{\chi}^0} > m_W$, using limits on upgoing muons produced by energetic neutrinos from neutralino annihilation in the Sun and the Earth.

[41] BOTTINO 92 excludes some region M_2-μ parameter space assuming that the lightest neutralino is the dark matter, using upgoing muons at Kamiokande, direct searches by Ge detectors, and by LEP experiments. The analysis includes top radiative corrections on Higgs parameters and employs two different hypotheses for nucleon-Higgs coupling. Effects of rescaling in the local neutralino density according to the neutralino relic abundance are taken into account.

[42] BOTTINO 91 excluded a region in $M_2 - \mu$ plane using upgoing muon data from Kamioka experiment, assuming that the dark matter surrounding us is composed of neutralinos and that the Higgs boson is not too heavy.

[43] GELMINI 91 exclude a region in $M_2 - \mu$ plane using dark matter searches.

[44] KAMIONKOWSKI 91 excludes a region in the M_2–μ plane using IMB limit on upgoing muons originated by energetic neutrinos from neutralino annihilation in the sun, assuming that the dark matter is composed of neutralinos and that $m_{H^0_1} \lesssim$ 50 GeV. See Fig. 8 in the paper.

[45] MORI 91B exclude a part of the region in the M_2–μ plane with $m_{\widetilde{\chi}^0_1} \lesssim$ 80 GeV using a limit on upgoing muons originated by energetic neutrinos from neutralino annihilation in the earth, assuming that the dark matter surrounding us is composed of neutralinos and that $m_{H^0_1} \lesssim$ 80 GeV.

[46] OLIVE 88 result assumes that photinos make up the dark matter in the galactic halo. Limit is based on annihilations in the sun and is due to an absence of high energy neutrinos detected in underground experiments. The limit is model dependent.

$\widetilde{\chi}^0_1$-p elastic cross section

Experimental results on the $\widetilde{\chi}^0_1$-p elastic cross section are evaluated at $m_{\widetilde{\chi}^0_1}$=100 GeV. The experimental results on the cross section are often mass dependent. Therefore, the mass and cross section results are also given where the limit is strongest, when appropriate. Results are quoted separately for spin-dependent interactions (based on an effective 4-Fermi Lagrangian of the form $\overline{\chi}\gamma^\mu\gamma^5\chi\overline{q}\gamma_\mu\gamma^5 q$) and spin-independent interactions ($\overline{\chi}\chi\overline{q}q$). For calculational details see GRIEST 88B, ELLIS 88D, BARBIERI 89C, DREES 93B, ARNOWITT 96, BERGSTROM 96, and BAER 97 in addition to the theory papers listed in the Tables. For a description of the theoretical assumptions and experimental techniques underlying most of the listed papers, see the review on "Dark matter" in this "Review of Particle Physics," and references therein. Most of the following papers use galactic halo and nuclear interaction assumptions from (LEWIN 96).

Spin-dependent interactions

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 4 \times 10^{-5}$	90	[1] AMOLE	19	PICO	C_3F_8

$< 5 \times 10^{-4}$	90	[2] APRILE	19A	XE1T	Xe
$< 7 \times 10^{-4}$	90	[3] XIA	19A	PNDX	Xe
$< 8 \times 10^{-4}$	90	[4] AKERIB	17A	LUX	Xe
< 0.28	90	[5] BATTAT	17	DRFT	CS_2; CF_4
< 0.027	90	[6] BEHNKE	17	PICA	C_4F_{10}
$< 5 \times 10^{-4}$	90	[7] AMOLE	16	PICO	CF_3I
$< 6.8 \times 10^{-3}$	90	[8] APRILE	16B	X100	Xe
$< 6.3 \times 10^{-3}$	90	[9] FELIZARDO	14	SMPL	C_2ClF_5
< 0.01	90	[10] AKIMOV	12	ZEP3	Xe
$< 7 \times 10^{-3}$		[11] BEHNKE	12	COUP	CF_3I
$< 8.5 \times 10^{-3}$		[12] FELIZARDO	12	SMPL	C_2ClF_5
< 0.016	90	[13] KIM	12	KIMS	CsI
5×10^{-10} to 10^{-5}	95	[14] BUCHMUEL...	11B	THEO	
< 1	90	[15] ANGLE	08A	XE10	Xe
< 0.055		[16] BEDNYAKOV	08	HDMS	Ge
< 0.33	90	[17] BEHNKE	08	COUP	CF_3I
< 5		[18] AKERIB	06	CDMS	Ge
< 2		[19] SHIMIZU	06A	CNTR	CaF_2
< 0.4		[20] ALNER	05	NAIA	NaI Spin Dep.
< 2		[21] BARNABE-HE...	05	PICA	C
2×10^{-11} to 1×10^{-4}		[22] ELLIS	04	THEO	$\mu > 0$
< 0.8		[23] AHMED	03	NAIA	NaI Spin Dep.
< 40		[24] TAKEDA	03	BOLO	NaF Spin Dep.
< 10		[25] ANGLOHER	02	CRES	Saphire
8×10^{-7} to 2×10^{-5}		[26] ELLIS	01C	THEO	$\tan\beta \leq 10$
< 3.8		[27] BERNABEI	00D	DAMA	Xe
< 0.8		SPOONER	00	UKDM	NaI
< 4.8		[28] BELLI	99C	DAMA	F
<100		[29] OOTANI	99	BOLO	LiF
< 0.6		BERNABEI	98C	DAMA	Xe
< 5		[28] BERNABEI	97	DAMA	F

[1] The strongest limit is $< 2.5 \times 10^{-5}$ pb at $m_\chi = 25$ GeV. This updates AMOLE 17.

[2] The strongest limit is $< 2 \times 10^{-4}$ pb at $m_\chi = 30$ GeV. For scatterings on neutrons, the strongest limit is $< 6.3 \times 10^{-6}$ at $m_\chi = 30$ GeV.

[3] The strongest limit is $< 4.4 \times 10^{-4}$ pb at $m_\chi = 40$ GeV. This updates FU 17.

[4] The strongest limit is 5×10^{-4} pb at $m_\chi = 35$ GeV. The limit for scattering on neutrons is 3×10^{-5} pb at 100 GeV and is 1.6×10^{-5} pb at 35 GeV. This updates AKERIB 16A.

[5] Directional recoil detector. This updates DAW 12.

[6] This result updates ARCHAMBAULT 12. The strongest limit is 0.013 pb at $m_\chi = 20$ GeV.

[7] The strongest limit is 5×10^{-4} pb at $m_\chi = 80$ GeV.

[8] The strongest limit is 5.2×10^{-3} pb at 50 GeV. The limit for scattering on neutrons is 2.8×10^{-4} pb at 100 GeV and the strongest limit is 2.0×10^{-4} pb at 50 GeV. This updates APRILE 13.

[9] The strongest limit is 0.0043 pb and occurs at $m_\chi = 35$ GeV. FELIZARDO 14 also presents limits for the scattering on neutrons. At $m_\chi = 100$ GeV, the upper limit is 0.13 pb and the strongest limit is 0.066 pb at $m_\chi = 35$ GeV.

[10] This result updates LEBEDENKO 09A. The strongest limit is 8×10^{-3} pb at $m_\chi = 50$ GeV. Limit applies to the neutralino neutron elastic cross section.

[11] The strongest limit is 6×10^{-3} at $m_\chi = 60$ GeV.
[12] The strongest limit is 5.7×10^{-3} at $m_\chi = 35$ GeV.
[13] This result updates LEE 07A. The strongest limit is at $m_\chi = 80$ GeV.
[14] Predictions for the spin-dependent elastic cross section based on a frequentist approach to electroweak observables in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.
[15] The strongest limit is 0.6 pb and occurs at m_χ= 30 GeV. The limit for scattering on neutrons is 0.01 pb at m_χ= 100 GeV, and the strongest limit is 0.0045 pb at m_χ= 30 GeV.
[16] Limit applies to neutron elastic cross section.
[17] The strongest upper limit is 0.25 pb and occurs at $m_\chi \simeq 40$ GeV.
[18] The strongest upper limit is 4 pb and occurs at $m_\chi \simeq 60$ GeV. The limit on the neutron spin-dependent elastic cross section is 0.07 pb. This latter limit is improved in AHMED 09, where a limit of 0.02 pb is obtained at $m_\chi = 100$ GeV. The strongest limit in AHMED 09 is 0.018 pb and occurs at $m_\chi = 60$ GeV.
[19] The strongest upper limit is 1.2 pb and occurs at $m_\chi \simeq 40$ GeV. The limit on the neutron spin-dependent cross section is 35 pb.
[20] The strongest upper limit is 0.35 pb and occurs at $m_\chi \simeq 60$ GeV.
[21] The strongest upper limit is 1.2 pb and occurs $m_\chi \simeq 30$ GeV.
[22] ELLIS 04 calculates the χp elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry, but without universal scalar masses. In the case of universal squark and slepton masses, but non-universal Higgs masses, the limit becomes 2×10^{-4}, see ELLIS 03E.
[23] The strongest upper limit is 0.75 pb and occurs at $m_\chi \approx 70$ GeV.
[24] The strongest upper limit is 30 pb and occurs at $m_\chi \approx 20$ GeV.
[25] The strongest upper limit is 8 pb and occurs at $m_\chi \simeq 30$ GeV.
[26] ELLIS 01C calculates the χ-p elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. In models with nonuniversal Higgs masses, the upper limit to the cross section is 6×10^{-4}.
[27] The strongest upper limit is 3 pb and occurs at $m_\chi \simeq 60$ GeV. The limits are for inelastic scattering $X^0 + {}^{129}\mathrm{Xe} \rightarrow X^0 + {}^{129}\mathrm{Xe}^*$ (39.58 keV).
[28] The strongest upper limit is 4.4 pb and occurs at $m_\chi \simeq 60$ GeV.
[29] The strongest upper limit is about 35 pb and occurs at $m_\chi \simeq 15$ GeV.

Spin-independent interactions

VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 2.5 \times 10^{-8}$	90	[1] ABE	19	XMAS	Xe
$< 3.9 \times 10^{-9}$	90	[2] AJAJ	19	DEAP	Ar
$< 2 \times 10^{-8}$	90	[3] AMOLE	19	PICO	C_3F_8
$< 2.25 \times 10^{-6}$	90	[4] ADHIKARI	18	C100	NaI
$< 1.14 \times 10^{-8}$	90	[5] AGNES	18A	DS50	Ar
$< 1.6 \times 10^{-8}$	90	[6] AGNESE	18A	CDMS	Ge
$< 9 \times 10^{-11}$	90	[7] APRILE	18	XE1T	Xe
$< 1.8 \times 10^{-10}$	90	[8] AKERIB	17	LUX	Xe
$< 1.4 \times 10^{-10}$	90	[9] CUI	17A	PNDX	Xe
$< 1.5 \times 10^{-9}$	90	[10] APRILE	16B	X100	Xe
$< 1.5 \times 10^{-9}$	90	[11] AKERIB	14	LUX	Xe
10^{-11}–10^{-7}	95	[12] BUCHMUEL...	14A	THEO	

$< 4.6 \times 10^{-6}$	90	13	FELIZARDO	14	SMPL	C_2ClF_5
10^{-11}–10^{-8}	95	14	ROSZKOWSKI	14	THEO	
$< 2.2 \times 10^{-6}$	90	15	AGNESE	13	CDMS	Si
$< 5 \times 10^{-8}$	90	16	AKIMOV	12	ZEP3	Xe
1.6×10^{-6}; 3.7×10^{-5}		17	ANGLOHER	12	CRES	$CaWO_4$
3×10^{-12} to 3×10^{-9}	95	18	BECHTLE	12	THEO	
$< 1.6 \times 10^{-7}$		19	BEHNKE	12	COUP	CF_3I
$< 2.3 \times 10^{-7}$	90	20	KIM	12	KIMS	CsI
$< 3.3 \times 10^{-8}$	90	21	AHMED	11A		Ge
$< 4.4 \times 10^{-8}$	90	22	ARMENGAUD	11	EDE2	Ge
$< 1 \times 10^{-7}$	90	23	ANGLE	08	XE10	Xe
$< 1 \times 10^{-6}$	90		BENETTI	08	WARP	Ar
$< 7.5 \times 10^{-7}$	90	24	ALNER	07A	ZEP2	Xe
$< 2 \times 10^{-7}$		25	AKERIB	06A	CDMS	Ge
$<90 \times 10^{-7}$			ALNER	05	NAIA	NaI Spin Indep.
$<12 \times 10^{-7}$		26	ALNER	05A	ZEPL	
$<14 \times 10^{-7}$			SANGLARD	05	EDEL	Ge
$< 4 \times 10^{-7}$		27	AKERIB	04	CDMS	Ge
2×10^{-11} to 1.5×10^{-7}	95	28	BALTZ	04	THEO	
2×10^{-11} to 8×10^{-6}		29,30	ELLIS	04	THEO	$\mu > 0$
$< 5 \times 10^{-8}$		31	PIERCE	04A	THEO	
$< 2 \times 10^{-5}$		32	AHMED	03	NAIA	NaI Spin Indep.
$< 3 \times 10^{-6}$		33	AKERIB	03	CDMS	Ge
2×10^{-13} to 2×10^{-7}		34	BAER	03A	THEO	
$< 1.4 \times 10^{-5}$		35	KLAPDOR-K...	03	HDMS	Ge
$< 6 \times 10^{-6}$		36	ABRAMS	02	CDMS	Ge
1×10^{-12} to 7×10^{-6}		29	KIM	02B	THEO	
$< 3 \times 10^{-5}$		37	MORALES	02B	CSME	Ge
$< 1 \times 10^{-5}$		38	MORALES	02C	IGEX	Ge
$< 1 \times 10^{-6}$			BALTZ	01	THEO	
$< 3 \times 10^{-5}$		39	BAUDIS	01	HDMS	Ge
$< 7 \times 10^{-6}$		40	BOTTINO	01	THEO	
$< 1 \times 10^{-8}$		41	CORSETTI	01	THEO	$\tan\beta \leq 25$
5×10^{-10} to 1.5×10^{-8}		42	ELLIS	01C	THEO	$\tan\beta \leq 10$
$< 4 \times 10^{-6}$		41	GOMEZ	01	THEO	
2×10^{-10} to 1×10^{-7}		41	LAHANAS	01	THEO	
$< 3 \times 10^{-6}$			ABUSAIDI	00	CDMS	Ge, Si
$< 6 \times 10^{-7}$		43	ACCOMANDO	00	THEO	
		44	BERNABEI	00	DAMA	NaI
2.5×10^{-9} to 3.5×10^{-8}		45	FENG	00	THEO	$\tan\beta=10$
$< 1.5 \times 10^{-5}$			MORALES	00	IGEX	Ge
$< 4 \times 10^{-5}$			SPOONER	00	UKDM	NaI
$< 7 \times 10^{-6}$			BAUDIS	99	HDMO	^{76}Ge
$< 7 \times 10^{-6}$			BERNABEI	98C	DAMA	Xe

[1] The strongest upper limit is 2.2×10^{-8} pb at 60 GeV.
[2] This updates AMAUDRUZ 18.
[3] This updates AMOLE 16.
[4] The strongest limit is 2.05×10^{-6} at m = 60 GeV.
[5] The strongest limit is 1.09×10^{-8} pb at $m_\chi = 126$ GeV. This updates AGNES 15.
[6] The strongest limit is 1.0×10^{-8} pb at $m_\chi = 46$ GeV. This updates AGNESE 15B.

[7] Based on 278.8 days of data collection. The strongest limit is 4.1×10^{-11} pb at $m_\chi =$ 30 GeV. This updates APRILE 17G.
[8] AKERIB 17. The strongest limit is 1.1×10^{-10} pb at 50 GeV. This updates AKERIB 16.
[9] The strongest limit is 8.6×10^{-11} pb at 40 GeV. This updates TAN 16B.
[10] The strongest limit is 1.1×10^{-9} pb at 50 GeV. This updates APRILE 12.
[11] The strongest upper limit is 7.6×10^{-10} at $m_\chi = 33$ GeV.
[12] Predictions for the spin-independent elastic cross section based on a frequentist approach to electroweak observables in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using the 20 fb^{-1} 8 TeV and the 5 fb^{-1} 7 TeV LHC data and the LUX data.
[13] The strongest limit is 3.6×10^{-6} pb and occurs at $m_\chi = 35$ GeV. Felizardo 2014 updates Felizardo 2012.
[14] Predictions for the spin-independent elastic cross section based on a Bayesian approach to electroweak observables in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using the 20 fb^{-1} LHC data and LUX.
[15] AGNESE 13 presents 90% CL limits on the elastic cross section for masses in the range 7–100 GeV using the Si based detector. The strongest upper limit is 1.8×10^{-6} pb at $m_\chi = 50$ GeV. This limit is improved to 7×10^{-7} pb in AGNESE 13A.
[16] This result updates LEBEDENKO 09. The strongest limit is 3.9×10^{-8} pb at $m_\chi =$ 52 GeV.
[17] ANGLOHER 12 presents results of 730 kg days from the CRESST-II dark matter detector. They find two maxima in the likelihood function corresponding to best fit WIMP masses of 25.3 and 11.6 GeV with elastic cross sections of 1.6×10^{-6} and 3.7×10^{-5} pb respectively, see their Table 4. The statistical significance is more than 4σ. ANGLOHER 12 updates ANGLOHER 09
[18] Predictions for the spin-independent elastic cross section based on a frequentist approach to electroweak observables in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using the 5 fb^{-1} LHC data and XENON100.
[19] The strongest limit is 1.4×10^{-7} at $m_\chi = 60$ GeV.
[20] This result updates LEE 07A. The strongest limit is 2.1×10^{-7} at $m_\chi = 70$ GeV.
[21] AHMED 11A gives combined results from CDMS and EDELWEISS. The strongest limit is at $m_\chi = 90$ GeV.
[22] ARMENGAUD 11 updates result of ARMENGAUD 10. Strongest limit at $m_\chi = 85$ GeV.
[23] The strongest upper limit is 5.1×10^{-8} pb and occurs at $m_\chi \simeq 30$ GeV. The values quoted here are based on the analysis performed in ANGLE 08 with the update from SORENSEN 09.
[24] The strongest upper limit is 6.6×10^{-7} pb and occurs at $m_\chi \simeq 65$ GeV.
[25] AKERIB 06A updates the results of AKERIB 05. The strongest upper limit is 1.6×10^{-7} pb and occurs at $m_\chi \approx 60$ GeV.
[26] The strongest upper limit is also close to 1.0×10^{-6} pb and occurs at $m_\chi \simeq 70$ GeV. BENOIT 06 claim that the discrimination power of ZEPLIN-I measurement (ALNER 05A) is not reliable enough to obtain a limit better than 1×10^{-3} pb. However, SMITH 06 do not agree with the criticisms of BENOIT 06.
[27] AKERIB 04 is incompatible with BERNABEI 00 most likely value, under the assumption of standard WIMP-halo interactions. The strongest upper limit is 4×10^{-7} pb and occurs at $m_\chi \simeq 60$ GeV.
[28] Predictions for the spin-independent elastic cross section in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.
[29] KIM 02 and ELLIS 04 calculate the χp elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry, but without universal scalar masses.

[30] In the case of universal squark and slepton masses, but non-universal Higgs masses, the limit becomes 2×10^{-6} (2×10^{-11} when constraint from the BNL $g{-}2$ experiment are included), see ELLIS 03E. ELLIS 05 display the sensitivity of the elastic scattering cross section to the π-Nucleon Σ term.

[31] PIERCE 04A calculates the χp elastic scattering cross section in the framework of models with very heavy scalar masses. See Fig. 2 of the paper.

[32] The strongest upper limit is 1.8×10^{-5} pb and occurs at $m_\chi \approx 80$ GeV.

[33] Under the assumption of standard WIMP-halo interactions, Akerib 03 is incompatible with BERNABEI 00 most likely value at the 99.98% CL. See Fig. 4.

[34] BAER 03A calculates the χp elastic scattering cross section in several models including the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry.

[35] The strongest upper limit is 7×10^{-6} pb and occurs at $m_\chi \simeq 30$ GeV.

[36] ABRAMS 02 is incompatible with the DAMA most likely value at the 99.9% CL. The strongest upper limit is 3×10^{-6} pb and occurs at $m_\chi \simeq 30$ GeV.

[37] The strongest upper limit is 2×10^{-5} pb and occurs at $m_\chi \simeq 40$ GeV.

[38] The strongest upper limit is 7×10^{-6} pb and occurs at $m_\chi \simeq 46$ GeV.

[39] The strongest upper limit is 1.8×10^{-5} pb and occurs at $m_\chi \simeq 32$ GeV

[40] BOTTINO 01 calculates the χ-p elastic scattering cross section in the framework of the following supersymmetric models: N=1 supergravity with the radiative breaking of the electroweak gauge symmetry, N=1 supergravity with nonuniversal scalar masses and an effective MSSM model at the electroweak scale.

[41] Calculates the χ-p elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry.

[42] ELLIS 01C calculates the χ-p elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. ELLIS 02B find a range 2×10^{-8}–1.5×10^{-7} at $\tan\beta$=50. In models with nonuniversal Higgs masses, the upper limit to the cross section is 4×10^{-7}.

[43] ACCOMANDO 00 calculate the χ-p elastic scattering cross section in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. The limit is relaxed by at least an order of magnitude when models with nonuniversal scalar masses are considered. A subset of the authors in ARNOWITT 02 updated the limit to $< 9 \times 10^{-8}$ ($\tan\beta < 55$).

[44] BERNABEI 00 search for annual modulation of the WIMP signal. The data favor the hypothesis of annual modulation at 4σ and are consistent, for a particular model framework quoted there, with $m_{\chi^0}=44^{+12}_{-\ 9}$ GeV and a spin-independent X^0-proton cross section of $(5.4 \pm 1.0) \times 10^{-6}$ pb. See also BERNABEI 01 and BERNABEI 00C.

[45] FENG 00 calculate the χ-p elastic scattering cross section in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry with a particular emphasis on focus point models. At $\tan\beta$=50, the range is 8×10^{-8}–4×10^{-7}.

Other bounds on $\widetilde{\chi}^0_1$ from astrophysics and cosmology

Most of these papers generally exclude regions in the $M_2-\mu$ parameter plane by requiring that the $\widetilde{\chi}^0_1$ contribution to the overall cosmological density is less than some maximal value to avoid overclosure of the Universe. Those not based on the cosmological density are indicated. Many of these papers also include LEP and/or other bounds.

VALUE	DOCUMENT ID		TECN	COMMENT
>46 GeV	[1] ELLIS	00	RVUE	

• • • We do not use the following data for averages, fits, limits, etc. • • •

	[2] ATHRON	17B	COSM
	[3] BECHTLE	16	COSM
	[4] BAGNASCHI	15	COSM
	[5] BUCHMUEL...	14	COSM
	[6] BUCHMUEL...	14A	COSM
	[7] ROSZKOWSKI	14	COSM
	[8] CABRERA	13	COSM
	[9] ELLIS	13B	COSM
	[8] STREGE	13	COSM
	[5] AKULA	12	COSM
	[5] ARBEY	12A	COSM
	[5] BAER	12	COSM
	[10] BALAZS	12	COSM
	[11] BECHTLE	12	COSM
	[12] BESKIDT	12	COSM
> 18 GeV	[13] BOTTINO	12	COSM
	[5] BUCHMUEL...	12	COSM
	[5] CAO	12A	COSM
	[5] ELLIS	12B	COSM
	[14] FENG	12B	COSM
	[5] KADASTIK	12	COSM
	[10] STREGE	12	COSM
	[15] BUCHMUEL...	11	COSM
	[16] ROSZKOWSKI	11	COSM
	[17] ELLIS	10	COSM
	[18] BUCHMUEL...	09	COSM
	[19] DREINER	09	THEO
	[20] BUCHMUEL...	08	COSM
	[16] ELLIS	08	COSM
	[21] CALIBBI	07	COSM
	[22] ELLIS	07	COSM
	[23] ALLANACH	06	COSM
	[24] DE-AUSTRI	06	COSM
	[16] BAER	05	COSM
	[25] BALTZ	04	COSM
> 6 GeV	[13,26] BELANGER	04	THEO
	[27] ELLIS	04B	COSM
	[28] PIERCE	04A	COSM
	[29] BAER	03	COSM
> 6 GeV	[13] BOTTINO	03	COSM
	[29] CHATTOPAD...	03	COSM
	[30] ELLIS	03	COSM
	[16] ELLIS	03B	COSM
	[29] ELLIS	03C	COSM
	[29] LAHANAS	03	COSM
	[31] LAHANAS	02	COSM
	[32] BARGER	01C	COSM
	[33] ELLIS	01B	COSM
	[30] BOEHM	00B	COSM
	[34] FENG	00	COSM

< 600 GeV	[35] ELLIS	98B	COSM	
	[36] EDSJO	97	COSM	Co-annihilation
	[37] BAER	96	COSM	
	[16] BEREZINSKY	95	COSM	
	[38] FALK	95	COSM	*CP*-violating phases
	[39] DREES	93	COSM	Minimal supergravity
	[40] FALK	93	COSM	Sfermion mixing
	[39] KELLEY	93	COSM	Minimal supergravity
	[41] MIZUTA	93	COSM	Co-annihilation
	[42] LOPEZ	92	COSM	Minimal supergravity, $m_0=A=0$
	[43] MCDONALD	92	COSM	
	[44] GRIEST	91	COSM	
	[45] NOJIRI	91	COSM	Minimal supergravity
	[46] OLIVE	91	COSM	
	[47] ROSZKOWSKI	91	COSM	
	[48] GRIEST	90	COSM	
	[46] OLIVE	89	COSM	
none 100 eV – 15 GeV	SREDNICKI	88	COSM	$\widetilde{\gamma}$; $m_{\widetilde{f}}$=100 GeV
none 100 eV–5 GeV	ELLIS	84	COSM	$\widetilde{\gamma}$; for $m_{\widetilde{f}}$=100 GeV
	GOLDBERG	83	COSM	$\widetilde{\gamma}$
	[49] KRAUSS	83	COSM	$\widetilde{\gamma}$
	VYSOTSKII	83	COSM	$\widetilde{\gamma}$

[1] ELLIS 00 updates ELLIS 98. Uses LEP e^+e^- data at $\sqrt{s}$=202 and 204 GeV to improve bound on neutralino mass to 51 GeV when scalar mass universality is assumed and 46 GeV when Higgs mass universality is relaxed. Limits on tanβ improve to > 2.7 ($\mu > 0$), > 2.2 ($\mu < 0$) when scalar mass universality is assumed and > 1.9 (both signs of μ) when Higgs mass universality is relaxed.

[2] ATHRON 17B places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using all Run I and the 13 fb^{-1} 13 TeV Run II LHC searches and other experimental data.

[3] BECHTLE 16 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using all Run I LHC searches.

[4] BAGNASCHI 15 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using all Run I LHC searches.

[5] Implications of the LHC result on the Higgs mass and on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.

[6] BUCHMUELLER 14A places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches using the 20 fb^{-1} 8 TeV and the 5 fb^{-1} 7 TeV LHC and the LUX data.

[7] ROSZKOWSKI 14 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using Bayesian statistics and indirect experimental searches using the 20 fb^{-1} LHC and the LUX data.

[8] CABRERA 13 and STREGE 13 place constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry with and without non-universal Higgs masses using the 5.8 fb^{-1}, $\sqrt{s} = 7$ TeV ATLAS supersymmetry searches and XENON100 results.

[9] ELLIS 13B place constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry with and without Higgs mass universality. Models with universality below the GUT scale are also considered.

[10] BALAZS 12 and STREGE 12 place constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using the 1 fb^{-1} LHC supersymmetry searches, the 5 fb^{-1} Higgs mass constraints, both with $\sqrt{s} = 7$ TeV, and XENON100 results.

[11] BECHTLE 12 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches, using the 5 fb^{-1} LHC and XENON100 data.

[12] BESKIDT 12 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches, the 5 fb^{-1} LHC and the XENON100 data.

[13] BELANGER 04 and BOTTINO 12 (see also BOTTINO 03, BOTTINO 03A and BOTTINO 04) do not assume gaugino or scalar mass unification.

[14] FENG 12B places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry and large sfermion masses using the 1 fb^{-1} LHC supersymmetry searches, the 5 fb^{-1} LHC Higgs mass constraints both with $\sqrt{s} = 7$ TeV, and XENON100 results.

[15] BUCHMUELLER 11 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches and including supersymmetry breaking relations between A and B parameters.

[16] Places constraints on the SUSY parameter space in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry but non-Universal Higgs masses.

[17] ELLIS 10 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry with universality above the GUT scale.

[18] BUCHMUELLER 09 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches.

[19] DREINER 09 show that in the general MSSM with non-universal gaugino masses there exists no model-independent laboratory bound on the mass of the lightest neutralino. An essentially massless χ_1^0 is allowed by the experimental and observational data, imposing some constraints on other MSSM parameters, including M_2, μ and the slepton and squark masses.

[20] BUCHMUELLER 08 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry using indirect experimental searches.

[21] CALIBBI 07 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry with universality above the GUT scale including the effects of right-handed neutrinos.

[22] ELLIS 07 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry with universality below the GUT scale.

[23] ALLANACH 06 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.

[24] DE-AUSTRI 06 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.

[25] BALTZ 04 places constraints on the SUSY parameter space in the framework of $N = 1$ supergravity models with radiative breaking of the electroweak gauge symmetry.

[26] Limit assumes a pseudo scalar mass < 200 GeV. For larger pseudo scalar masses, $m_\chi >$ 18(29) GeV for tan$\beta = 50(10)$. Bounds from WMAP, $(g-2)_\mu$, $b \to s\gamma$, LEP.

[27] ELLIS 04B places constraints on the SUSY parameter space in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry including supersymmetry breaking relations between A and B parameters. See also ELLIS 03D.

[28] PIERCE 04A places constraints on the SUSY parameter space in the framework of models with very heavy scalar masses.

[29] BAER 03, CHATTOPADHYAY 03, ELLIS 03C and LAHANAS 03 place constraints on the SUSY parameter space in the framework of N=1 supergravity models with radiative breaking of the electroweak gauge symmetry based on WMAP results for the cold dark matter density.

[30] BOEHM 00B and ELLIS 03 place constraints on the SUSY parameter space in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. Includes the effect of χ-$\widetilde{t}$ co-annihilations.

[31] LAHANAS 02 places constraints on the SUSY parameter space in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. Focuses on the role of pseudo-scalar Higgs exchange.

[32] BARGER 01C use the cosmic relic density inferred from recent CMB measurements to constrain the parameter space in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry.

[33] ELLIS 01B places constraints on the SUSY parameter space in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry. Focuses on models with large $\tan\beta$.

[34] FENG 00 explores cosmologically allowed regions of MSSM parameter space with multi-TeV masses.

[35] ELLIS 98B assumes a universal scalar mass and radiative supersymmetry breaking with universal gaugino masses. The upper limit to the LSP mass is increased due to the inclusion of $\chi - \widetilde{\tau}_R$ coannihilations.

[36] EDSJO 97 included all coannihilation processes between neutralinos and charginos for any neutralino mass and composition.

[37] Notes the location of the neutralino Z resonance and h resonance annihilation corridors in minimal supergravity models with radiative electroweak breaking.

[38] Mass of the bino (=LSP) is limited to $m_{\widetilde{B}} \lesssim$ 350 GeV for m_t = 174 GeV.

[39] DREES 93, KELLEY 93 compute the cosmic relic density of the LSP in the framework of minimal N=1 supergravity models with radiative breaking of the electroweak gauge symmetry.

[40] FALK 93 relax the upper limit to the LSP mass by considering sfermion mixing in the MSSM.

[41] MIZUTA 93 include coannihilations to compute the relic density of Higgsino dark matter.

[42] LOPEZ 92 calculate the relic LSP density in a minimal SUSY GUT model.

[43] MCDONALD 92 calculate the relic LSP density in the MSSM including exact tree-level annihilation cross sections for all two-body final states.

[44] GRIEST 91 improve relic density calculations to account for coannihilations, pole effects, and threshold effects.

[45] NOJIRI 91 uses minimal supergravity mass relations between squarks and sleptons to narrow cosmologically allowed parameter space.

[46] Mass of the bino (=LSP) is limited to $m_{\widetilde{B}} \lesssim$ 350 GeV for $m_t \leq 200$ GeV. Mass of the higgsino (=LSP) is limited to $m_{\widetilde{H}} \lesssim$ 1 TeV for $m_t \leq 200$ GeV.

[47] ROSZKOWSKI 91 calculates LSP relic density in mixed gaugino/higgsino region.

[48] Mass of the bino (=LSP) is limited to $m_{\widetilde{B}} \lesssim$ 550 GeV. Mass of the higgsino (=LSP) is limited to $m_{\widetilde{H}} \lesssim$ 3.2 TeV.

[49] KRAUSS 83 finds $m_{\widetilde{\gamma}}$ not 30 eV to 2.5 GeV. KRAUSS 83 takes into account the gravitino decay. Find that limits depend strongly on reheated temperature. For example a new allowed region $m_{\widetilde{\gamma}}$ = 4–20 MeV exists if $m_{\text{gravitino}}$ <40 TeV. See figure 2.

Unstable $\widetilde{\chi}^0_1$ (Lightest Neutralino) mass limit

Unless otherwise stated, results in this section assume spectra and production rates as evaluated in the MSSM. Unless otherwise stated, the goldstino or gravitino mass $m_{\widetilde{G}}$ is assumed to be negligible relative to all other masses. In the following, $\widetilde{G}$ is assumed to be undetected and to give rise to a missing energy ($\not\!\!E$) signature.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>380	95	[1] AAD	20AN	ATLS	$2\gamma + \not\!\!E_T$,Tn1n1A, GMSB
>525	95	[2] SIRUNYAN	19CA	CMS	$\widetilde{\chi}^0_1 \to \gamma \widetilde{G}$, GMSB, SPS8, $c\tau$=1 m
>290	95	[3] SIRUNYAN	19CI	CMS	$\geq 1\ H (\to \gamma\gamma)$ + jets + $\not\!\!E_T$, Tn1n1A, GMSB
>230	95	[3] SIRUNYAN	19CI	CMS	$\geq 1\ H (\to \gamma\gamma)$ + jets + $\not\!\!E_T$, Tn1n1B , GMSB
>930	95	[4] SIRUNYAN	19K	CMS	γ + lepton + $\not\!\!E_T$, Tchi1n1A
none 130–230, 290–880	95	[5] AABOUD	18CK	ATLS	$2H (\to b b)+\not\!\!E_T$,Tn1n1A, GMSB
>295	95	[6] AABOUD	18Z	ATLS	$\geq 4\ell$, GMSB, Tn1n1C
>180	95	[7] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tn1n1A
>260	95	[7] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tn1n1B
>450	95	[7] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tn1n1C
>750	95	[8] SIRUNYAN	18AP	CMS	Combination of searches, GMSB, Tn1n1A
>650	95	[8] SIRUNYAN	18AP	CMS	Combination of searches, GMSB, Tn1n1B
>690	95	[8] SIRUNYAN	18AP	CMS	Combination of searches, GMSB, Tn1n1C
>500	95	[9] SIRUNYAN	18AR	CMS	$\ell^\pm\ell^\mp$+ jets $+\not\!\!E_T$, GMSB, Tn1n1B
>650	95	[9] SIRUNYAN	18AR	CMS	$\ell^\pm\ell^\mp$+ jets $+\not\!\!E_T$, GMSB, Tn1n1C
none 230–770	95	[10] SIRUNYAN	18O	CMS	$2\ H (\to b b) + \not\!\!E_T$, Tn1n1A, GMSB
>205	95	[11] SIRUNYAN	18X	CMS	$\geq 1\ H (\to \gamma\gamma)$ + jets + $\not\!\!E_T$, Tn1n1A, GMSB
>130	95	[11] SIRUNYAN	18X	CMS	$\geq 1\ H (\to \gamma\gamma)$ + jets + $\not\!\!E_T$, Tn1n1B , GMSB
>380	95	[12] KHACHATRY...	14L	CMS	$\widetilde{\chi}^0_1 \to Z \widetilde{G}$ simplified models, GMSB, RPV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[13] AAD	20D		$\widetilde{q} \to q\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \to \ell\ell\nu$, RPV, λ_{121} or $\lambda_{122} \neq 0$
none 300–1000	95	[14] AABOUD	19G	ATLS	$\widetilde{\chi}^0_1 \to Z \widetilde{G}$ from gluinos as in Tglu1A, GMSB, depending on $c\tau$
		[15] AAIJ	17Z		displaced vertex with associated μ
		[16] KHACHATRY...	16BX	CMS	$\geq 3\ell^\pm$, RPV, λ or λ' couplings, wino- or higgsino-like neutralinos
		[17] AAD	14BH	ATLS	$2\gamma + \not\!\!E_T$, GMSB, SPS8
		[18] AAD	13AP	ATLS	$2\gamma + \not\!\!E_T$, GMSB, SPS8
none 220–380	95	[19] AAD	13Q	ATLS	$\gamma + b + \not\!\!E_T$, higgsino-like neutralino, GMSB

		[20] AAD	13R	ATLS	$\widetilde{\chi}_1^0 \rightarrow \mu j j$, RPV, $\lambda'_{211} \neq 0$
		[21] AALTONEN	13I	CDF	$\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$, $\not{E}_T$, GMSB
>220	95	[22] CHATRCHYAN	13AH	CMS	$\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$, GMSB, SPS8, $c\tau <$ 500 mm
		[23] AAD	12CP	ATLS	$2\gamma + \not{E}_T$, GMSB
		[24] AAD	12CT	ATLS	$\geq 4\ell^{\pm}$, RPV
		[25] AAD	12R	ATLS	$\widetilde{\chi}_1^0 \rightarrow \mu j j$, RPV, $\lambda'_{211} \neq 0$
		[26] ABAZOV	12AD	D0	$\widetilde{\chi}_1^0 \widetilde{\chi}_1^0 \rightarrow \gamma Z \widetilde{G} \widetilde{G}$, GMSB
		[27] CHATRCHYAN	12BK	CMS	$2\gamma + \not{E}_T$, GMSB
		[28] CHATRCHYAN	11B	CMS	$\widetilde{W}^0 \rightarrow \gamma \widetilde{G}$, $\widetilde{W}^{\pm} \rightarrow \ell^{\pm} \widetilde{G}$, GMSB
>149	95	[29] AALTONEN	10	CDF	$p \overline{p} \rightarrow \widetilde{\chi}\widetilde{\chi}$, $\widetilde{\chi}$=$\widetilde{\chi}_2^0$, $\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$, GMSB
>175	95	[30] ABAZOV	10P	D0	$\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$, GMSB
>125	95	[31] ABAZOV	08F	D0	$p \overline{p} \rightarrow \widetilde{\chi}\widetilde{\chi}$, $\widetilde{\chi}$=$\widetilde{\chi}_2^0$, $\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$, GMSB
		[32] ABULENCIA	07H	CDF	RPV, $LL\overline{E}$
> 96.8	95	[33] ABBIENDI	06B	OPAL	$e^+ e^- \rightarrow \widetilde{B}\widetilde{B}$, ($\widetilde{B} \rightarrow \widetilde{G}\gamma$)
		[34] ABDALLAH	05B	DLPH	$e^+ e^- \rightarrow \widetilde{G}\widetilde{\chi}_1^0$, ($\widetilde{\chi}_1^0 \rightarrow \widetilde{G}\gamma$)
> 96	95	[35] ABDALLAH	05B	DLPH	$e^+ e^- \rightarrow \widetilde{B}\widetilde{B}$, ($\widetilde{B} \rightarrow \widetilde{G}\gamma$)

[1] AAD 20AN searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two photons and missing transverse momentum. Events are further categorised in terms of lepton or jet multiplicity. No significant excess over the expected background is observed. Limits at 95% C.L. are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 11.

[2] SIRUNYAN 19CA searched in 77.4 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing delayed photons in both single and diphoton plus $\not{E}_T$ final states. No excess is observed above the background expected from Standard Model processes. The results are used to set 95% C.L. exclusion limits in the context of GMSB, using the SPS8 benchmark model. For neutralino proper decay lengths of 0.1, 1, 10, and 100 m, masses up to about 320, 525, 360, and 215 GeV are excluded, respectively. See their Fig. 5. The searches involve the simplified models Tglu1D, Tglu4A,B,C, Tsqk4,4A,4B.

[3] SIRUNYAN 19CI searched in 77.5 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model, see Figure 3, and on the wino mass in the Tchi1n2E simplified model, see their Figure 4. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 5.

[4] SIRUNYAN 19K searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with a photon, an electron or muon, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the chargino and neutralino mass in the Tchi1n1A simplified model, see their Figure 6. Limits are also set on the gluino mass in the Tglu4A simplified model, and on the squark mass in the Tsqk4A simplified model, see their Figure 7.

[5] AABOUD 18CK searched for events with at least 3 b-jets and large missing transverse energy in two datasets of pp collisions at $\sqrt{s} = 13$ TeV of 36.1 fb^{-1} and 24.3 fb^{-1} depending on the trigger requirements. The analyses aimed to reconstruct two Higgs bosons decaying to pairs of b-quarks. No significant excess above the Standard Model expectations is observed. Limits are set on the Higgsino mass in the Tn1n1A simplified model, see their Figure 15(a). Constraints are also presented as a function of the BR of Higgsino decaying into an higgs boson and a gravitino, see their Figure 15(b).

[6] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are

set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[7] SIRUNYAN 18AO searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and neutralinos in events with either two or more leptons (electrons or muons) of the same electric charge, or with three or more leptons, which can include up to two hadronically decaying tau leptons. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino/neutralino mass in the Tchi1n2A, Tchi1n2H, Tchi1n2D, Tchi1n2E and Tchi1n2F simplified models, see their Figures 14, 15, 16, 17 and 18. Limits are also set on the higgsino mass in the Tn1n1A, Tn1n1B and Tn1n1C simplified models, see their Figure 19.

[8] SIRUNYAN 18AP searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and neutralinos by combining a number of previous and new searches. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino/neutralino mass in the Tchi1n2E, Tchi1n2F and Tchi1n2I simplified models, see their Figures 7, 8, 9 an 10. Limits are also set on the higgsino mass in the Tn1n1A, Tn1n1B and Tn1n1C simplified models, see their Figure 11, 12, 13 and 14.

[9] SIRUNYAN 18AR searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing two opposite-charge, same-flavour leptons (electrons or muons), jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4C simplified model, see their Figure 7. Limits are also set on the chargino/neutralino mass in the Tchi1n2F simplified models, see their Figure 8, and on the higgsino mass in the Tn1n1B and Tn1n1C simplified models, see their Figure 9. Finally, limits are set on the sbottom mass in the Tsbot3 simplified model, see their Figure 10.

[10] SIRUNYAN 18O searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two Higgs bosons, decaying to pairs of b-quarks, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 9.

[11] SIRUNYAN 18X searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not{E}_T$. The razor variables (M_R and R^2) are used to categorise the events. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model and on the wino mass in the Tchi1n2E simplified model, see their Figure 5. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 6.

[12] KHACHATRYAN 14L searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for evidence of direct pair production of neutralinos with Higgs or Z-bosons in the decay chain, leading to HH, HZ and ZZ final states with missing transverse energy. The decays of 16–20. a Higgs boson to a b-quark pair, to a photon pair, and to final states with leptons are considered in conjunction with hadronic and leptonic decay modes of the Z and W bosons. No significant excesses over the expected SM backgrounds are observed. The results are interpreted in the context of GMSB simplified models where the decays $\widetilde{\chi}^0_1 \rightarrow H\widetilde{G}$ or $\widetilde{\chi}^0_1 \rightarrow Z\widetilde{G}$ take place either 100% or 50% of the time, see Figs. 16–20.

[13] AAD 20D searched in 32.8 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing an oppositely charge lepton pair (ee, $\mu\mu$ or $e\mu$) coming from long-lived neutralinos decaying through the R-parity-violating decay $\widetilde{\chi}^0_1 \rightarrow \ell\ell\nu$ with $\lambda_{121} \neq 0$ or $\lambda_{122} \neq 0$. No excess over the expected background is observed. Limits are derived for decay lengths of the neutralino between 1 mm and 10 m in a scenario where a squark-antisquark pair is produced, with the squark decaying to a quark and a $\widetilde{\chi}^0_1$, with either $\widetilde{\chi}^0_1 \rightarrow ee\nu/e\mu\nu$ ($\lambda_{121} \neq 0$) or $\widetilde{\chi}^0_1 \rightarrow e\mu\nu/\mu\mu\nu$ ($\lambda_{122} \neq 0$), see their Figures 4 and 5.

[14] AABOUD 19G searched in 32.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for evidence of neutralinos decaying into a Z-boson and a gravitino, in events characterized by the

presence of dimuon vertices with displacements from the pp interaction point in the range of 1400 cm. Neutralinos are assumed to be produced in the decay chain of gluinos as in Tglu1A models. No significant excess is observed in the number of vertices relative to the predicted background. In GGM with a gluino mass of 1100 GeV, neutralino masses in the range 300–1000 GeV are excluded for certain values of $c\tau$, see their Figure 7.

[15] AAIJ 17Z searched in 1 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV and in 2 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing a displaced vertex with one associated high transverse momentum μ. No excess is observed above the background expected from Standard Model processes. The results are used to set 95% C.L. upper limits on the cross section times branching fractions of pair-produced neutralinos decaying non-promptly into a muon and two quarks. Long-lived particles in a mass range 23–198 GeV are considered, see their Fig. 5 and Fig. 6.

[16] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing 3 or more leptons coming from the electroweak production of wino- or higgsino-like neutralinos, assuming non-zero R-parity-violating leptonic couplings λ_{122}, λ_{123}, and λ_{233} or semileptonic couplings λ'_{131}, λ'_{233}, λ'_{331}, and λ'_{333}. No excess over the expected background is observed and limits are derived on the neutralino mass, see Figs. 24 and 25.

[17] AAD 14BH searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing non-pointing photons in a diphoton plus missing transverse energy final state. No excess is observed above the background expected from Standard Model processes. The results are used to set 95% C.L. exclusion limits in the contact of gauge-mediated supersymmetric breaking models, with the lightest neutralino being the next-to-lightest supersymmetric particle and decaying with a lifetime in the range from 0.25 ns to about 100 ns into a photon and a gravitino. For limits on the NLSP lifetime versus Λ plane, for the SPS8 model, see their Fig. 7.

[18] AAD 13AP searched in 4.8 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing non-pointing photons in a diphoton plus missing transverse energy final state. No excess is observed above the background expected from Standard Model processes. The results are used to set 95% C.L. exclusion limits in the context of gauge-mediated supersymmetric breaking models, with the lightest neutralino being the next-to-lightest supersymmetric particle and decaying with a lifetime in excess of 0.25 ns into a photon and a gravitino. For limits in the NLSP lifetime versus Λ plane, for the SPS8 model, see their Fig. 8.

[19] AAD 13Q searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing a high-p_T isolated photon, at least one jet identified as originating from a bottom quark, and high missing transverse momentum. Such signatures may originate from supersymmetric models with gauge-mediated supersymmetry breaking in events in which one of a pair of higgsino-like neutralinos decays into a photon and a gravitino while the other decays into a Higgs boson and a gravitino. No significant excess above the expected background was found and limits were set on the neutralino mass in a generalized GMSB model (GGM) with a higgsino-like neutralino NLSP, see their Fig. 4. Intermediate neutralino masses between 220 and 380 GeV are excluded at 95% C.L, regardless of the squark and gluino masses, purely on the basis of the expected weak production.

[20] AAD 13R looked in 4.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing new, heavy particles that decay at a significant distance from their production point into a final state containing a high-momentum muon and charged hadrons. No excess over the expected background is observed and limits are placed on the production cross-section of neutralinos via squarks for various $m_{\widetilde{q}}$, $m_{\widetilde{\chi}^0_1}$ in an R-parity violating scenario with $\lambda'_{211} \neq 0$, as a function of the neutralino lifetime, see their Fig. 6.

[21] AALTONEN 13I searched in 6.3 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}$ = 1.96 TeV for events containing $\not\!\!E_T$ and a delayed photon that arrives late in the detector relative to the time expected from prompt production. No evidence of delayed photon production is observed.

[22] CHATRCHYAN 13AH searched in 4.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing $\not\!\!E_T$ and a delayed photon that arrives late in the detector relative to the time expected from prompt production. No significant excess above the expected background

was found and limits were set on the pair production of $\widetilde{\chi}_1^0$ depending on the neutralino proper decay length, see Fig. 8. Supersedes CHATRCHYAN 12BK.

[23] AAD 12CP searched in 4.8 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two photons and large $\not{E}_T$ due to $\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$ decays in a GMSB framework. No significant excess above the expected background was found and limits were set on the neutralino mass in a generalized GMSB model (GGM) with a bino-like neutralino NLSP, see Figs. 6 and 7. The other sparticle masses were decoupled, tanβ = 2 and $c\tau_{NLSP} < 0.1$ mm. Also, in the framework of the SPS8 model, limits are presented in Fig. 8.

[24] AAD 12CT searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing four or more leptons (electrons or muons) and either moderate values of missing transverse momentum or large effective mass. No significant excess is found in the data. Limits are presented in a simplified model of R-parity violating supersymmetry in which charginos are pair-produced and then decay into a W-boson and a $\widetilde{\chi}_1^0$, which in turn decays through an RPV coupling into two charged leptons ($e^\pm e^\mp$ or $\mu^\pm \mu^\mp$) and a neutrino. In this model, limits are set on the neutralino mass as a function of the chargino mass, see Fig. 3a. Limits are also set in an R-parity violating mSUGRA model, see Fig. 3b.

[25] AAD 12R looked in 33 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing new, heavy particles that decay at a significant distance from their production point into a final state containing a high-momentum muon and charged hadrons. No excess over the expected background is observed and limits are placed on the production cross-section of neutralinos via squarks for various ($m_{\widetilde{q}}$, $m_{\widetilde{\chi}_1^0}$) in an R-parity violating scenario with $\lambda'_{211} \neq 0$, as a function of the neutralino lifetime, see their Fig. 8. Superseded by AAD 13R.

[26] ABAZOV 12AD looked in 6.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 1.96 TeV for events with a photon, a Z-boson, and large $\not{E}_T$ in the final state. This topology corresponds to a GMSB model where pairs of neutralino NLSPs are either pair produced promptly or from decays of other supersymmetric particles and then decay to either $Z \widetilde{G}$ or $\gamma \widetilde{G}$. No significant excess over the SM expectation is observed and a limit at 95% C.L. on the cross section is derived as a function of the effective SUSY breaking scale Λ, see Fig. 3. Assuming N_{mes} = 2, M_{mes} = 3 Λ, tanβ = 3, μ = 0.75 M_1, and C_{grav} = 1, the model is excluded at 95% C.L. for values of $\Lambda < 87$ TeV.

[27] CHATRCHYAN 12BK searched in 2.23 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two photons and large $\not{E}_T$ due to $\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$ decays in a GMSB framework. No significant excess above the expected background was found and limits were set on the pair production of $\widetilde{\chi}_1^0$ depending on the neutralino lifetime, see Fig. 6.

[28] CHATRCHYAN 11B looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$=7 TeV for events with an isolated lepton (e or μ), a photon and $\not{E}_T$ which may arise in a generalized gauge mediated model from the decay of Wino-like NLSPs. No evidence for an excess over the expected background is observed. Limits are derived in the plane of squark/gluino mass versus Wino mass (see Fig. 4). Mass degeneracy of the produced squarks and gluinos is assumed.

[29] AALTONEN 10 searched in 2.6 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}$ = 1.96 TeV for diphoton events with large $\not{E}_T$. They may originate from the production of $\widetilde{\chi}^\pm$ in pairs or associated to a $\widetilde{\chi}_2^0$, decaying into $\widetilde{\chi}_1^0$ which itself decays in GMSB to $\gamma \widetilde{G}$. There is no excess of events beyond expectation. An upper limit on the cross section is calculated in the GMSB model as a function of the $\widetilde{\chi}_1^0$ mass and lifetime, see their Fig. 2. A limit is derived on the $\widetilde{\chi}_1^0$ mass of 149 GeV for $\tau_{\widetilde{\chi}_1^0} \ll 1$ ns, which improves the results of previous searches.

[30] ABAZOV 10P looked in 6.3 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}$ = 1.96 TeV for events with at least two isolated γs and large $\not{E}_T$. These could be the signature of $\widetilde{\chi}_2^0$ and $\widetilde{\chi}_1^\pm$ production, decaying to $\widetilde{\chi}_1^0$ and finally $\widetilde{\chi}_1^0 \rightarrow \gamma \widetilde{G}$ in a GMSB framework. No significant excess over the SM expectation is observed, and a limit at 95% C.L. on the cross section

is derived for $N_{mes} = 1$, tan$\beta = 15$ and $\mu > 0$, see their Fig. 2. This allows them to set a limit on the effective SUSY breaking scale $\Lambda > 124$ TeV, from which the excluded $\widetilde{\chi}^0_1$ mass range is obtained.

[31] ABAZOV 08F looked in 1.1 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for diphoton events with large $\not{E}_T$. They may originate from the production of $\widetilde{\chi}^{\pm}$ in pairs or associated to a $\widetilde{\chi}^0_2$, decaying to a $\widetilde{\chi}^0_1$ which itself decays promptly in GMSB to $\widetilde{\chi}^0_1 \rightarrow \gamma \widetilde{G}$. No significant excess was found compared to the background expectation. A limit is derived on the masses of SUSY particles in the GMSB framework for $M = 2\Lambda$, $N = 1$, tan$\beta =$ 15 and $\mu > 0$, see Figure 2. It also excludes $\Lambda < 91.5$ TeV. Supersedes the results of ABAZOV 05A. Superseded by ABAZOV 10P.

[32] ABULENCIA 07H searched in 346 pb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for events with at least three leptons (e or μ) from the decay of $\widetilde{\chi}^0_1$ via $LL\overline{E}$ couplings. The results are consistent with the hypothesis of no signal. Upper limits on the cross-section are extracted and a limit is derived in the framework of mSUGRA on the masses of $\widetilde{\chi}^0_1$ and $\widetilde{\chi}^{\pm}_1$, see e.g. their Fig. 3 and Tab. II.

[33] ABBIENDI 06B use 600 pb^{-1} of data from $\sqrt{s} = 189$–209 GeV. They look for events with diphotons + $\not{E}$ final states originating from prompt decays of pair-produced neutralinos in a GMSB scenario with $\widetilde{\chi}^0_1$ NLSP. Limits on the cross-section are computed as a function of m($\widetilde{\chi}^0_1$), see their Fig. 14. The limit on the $\widetilde{\chi}^0_1$ mass is for a pure Bino state assuming a prompt decay, with lifetimes up to 10^{-9}s. Supersedes the results of ABBIENDI 04N.

[34] ABDALLAH 05B use data from $\sqrt{s} = 180$–209 GeV. They look for events with single photons + $\not{E}$ final states. Limits are computed in the plane (m($\widetilde{G}$) , m($\widetilde{\chi}^0_1$)), shown in their Fig. 9b for a pure Bino state in the GMSB framework and in Fig. 9c for a no-scale supergravity model. Supersedes the results of ABREU 00Z.

[35] ABDALLAH 05B use data from $\sqrt{s} = 130$–209 GeV. They look for events with diphotons + $\not{E}$ final states and single photons not pointing to the vertex, expected in GMSB when the $\widetilde{\chi}^0_1$ is the NLSP. Limits are computed in the plane (m($\widetilde{G}$), m($\widetilde{\chi}^0_1$)), see their Fig. 10. The lower limit is derived on the $\widetilde{\chi}^0_1$ mass for a pure Bino state assuming a prompt decay and $m_{\widetilde{e}_R} = m_{\widetilde{e}_L} = 2\ m_{\widetilde{\chi}^0_1}$. It improves to 100 GeV for $m_{\widetilde{e}_R} = m_{\widetilde{e}_L} = 1.1\ m_{\widetilde{\chi}^0_1}$. and the limit in the plane (m($\widetilde{\chi}^0_1$), m($\widetilde{e}_R$)) is shown in Fig. 10b. For long-lived neutralinos, cross-section limits are displayed in their Fig 11. Supersedes the results of ABREU 00Z.

$\widetilde{\chi}^0_2$, $\widetilde{\chi}^0_3$, $\widetilde{\chi}^0_4$ (Neutralinos) mass limits

Neutralinos are unknown mixtures of photinos, z-inos, and neutral higgsinos (the supersymmetric partners of photons and of Z and Higgs bosons). The limits here apply only to $\widetilde{\chi}^0_2$, $\widetilde{\chi}^0_3$, and $\widetilde{\chi}^0_4$. $\widetilde{\chi}^0_1$ is the lightest supersymmetric particle (LSP); see $\widetilde{\chi}^0_1$ Mass Limits. It is not possible to quote rigorous mass limits because they are extremely model dependent; i.e. they depend on branching ratios of various $\widetilde{\chi}^0$ decay modes, on the masses of decay products ($\widetilde{e}$, $\widetilde{\gamma}$, $\widetilde{q}$, $\widetilde{g}$), and on the $\widetilde{e}$ mass exchanged in $e^+e^- \rightarrow \widetilde{\chi}^0_i \widetilde{\chi}^0_j$. Limits arise either from direct searches, or from the MSSM constraints set on the gaugino and higgsino mass parameters M_2 and μ through searches for lighter charginos and neutralinos. Often limits are given as contour plots in the $m_{\widetilde{\chi}^0} - m_{\widetilde{e}}$ plane vs other parameters. When specific assumptions are made, e.g, the neutralino is a pure photino ($\widetilde{\gamma}$), pure z-ino ($\widetilde{Z}$), or pure neutral higgsino ($\widetilde{H}^0$), the neutralinos will be labelled as such.

Limits obtained from e^+e^- collisions at energies up to 136 GeV, as well as other limits from different techniques, are now superseded and have not been included in this compilation. They can be found in the 1998 Edition (The European Physical Journal **C3** 1 (1998)) of this Review. Some later papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$>$ 380	95	[1] AAD	20AN	ATLS	2γ + $\not\!\!E_T$,Tn1n1A, GMSB
$>$ 193	95	[2] AAD	20I	ATLS	2ℓ (soft), jets, $\not\!\!E_T$; Tchi1n2Ga, higgsino, $m_{\widetilde{\chi}_2^0}-m_{\widetilde{\chi}_1^0}$=9.3 GeV
$>$ 240	95	[3] AAD	20I	ATLS	2ℓ (soft), jets, $\not\!\!E_T$; Tchi1n2Fa, wino, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 7 GeV
$>$ 345	95	[4] AAD	20K	ATLS	3ℓ+$\not\!\!E_T$, Tchi1n2F, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 740	95	[5] AAD	20R	ATLS	1ℓ + 2b-jets + $\not\!\!E_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 290	95	[6] SIRUNYAN	20AU	CMS	soft τ + jet + $\not\!\!E_T$, Tchi1n2D, wino, $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}$ = 50 GeV
$>$ 680	95	[7] AABOUD	19AU	ATL	0, 1, 2 or more ℓ, H ($\rightarrow$ $\gamma\gamma$, $b\overline{b}$, $W W^*$, $Z Z^*$, $\tau\tau$) (various searches), Tchi1n2E, $m_{\widetilde{\chi}_1^0}$=0 GeV
$>$ 112	95	[8] SIRUNYAN	19BU	CMS	$p p \rightarrow \widetilde{\chi}_1^+ \widetilde{\chi}_2^0$ + 2 jets, $\widetilde{\chi}_2^0 \rightarrow \ell^+ \ell^- \widetilde{\chi}_1^0$, heavy sleptons, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 1 GeV, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^+}$
$>$ 215	95	[8] SIRUNYAN	19BU	CMS	$p p \rightarrow \widetilde{\chi}_1^+ \widetilde{\chi}_2^0$ + 2 jets, $\widetilde{\chi}_2^0 \rightarrow \ell^+ \ell^- \widetilde{\chi}_1^0$, heavy sleptons, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 30 GeV, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^+}$
$>$ 760	95	[9] AABOUD	18AY	ATLS	2τ+$\not\!\!E_T$, Tchi1n2D and $\widetilde{\tau}_L$-only, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$1125	95	[10] AABOUD	18BT	ATLS	2,3ℓ+$\not\!\!E_T$, Tchi1n2C, $m_{\widetilde{\chi}_1^0}$=0 GeV
> 580	95	[11] AABOUD	18BT	ATLS	2,3ℓ+$\not\!\!E_T$, Tchi1n2F, $m_{\widetilde{\chi}_1^0}$=0 GeV
none 130–230, 290–880	95	[12] AABOUD	18CK	ATLS	$2H$ ($\rightarrow$ $b\overline{b}$)+$\not\!\!E_T$,Tn1n1A, GMSB
none 220–600	95	[13] AABOUD	18CO	ATLS	2,3ℓ + $\not\!\!E_T$, recursive jigsaw, Tchi1n2F, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 145	95	[14] AABOUD	18R	ATLS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2G, higgsino, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 5 GeV
$>$ 175	95	[15] AABOUD	18R	ATLS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2F, wino, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 10 GeV
$>$1060	95	[16] AABOUD	18U	ATLS	2 γ + $\not\!\!E_T$, GGM,Tchi1chi1A, any NLSP mass
$>$ 167	95	[17] SIRUNYAN	18AJ	CMS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2G, higgsino, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 15 GeV

>710	95	[18] SIRUNYAN	18DP	CMS	$2\tau+\not{E}_T$, Tchi1n2D, $m_{\widetilde{\chi}_1^0}=0$ GeV
none 220–490	95	[19] SIRUNYAN	17AW	CMS	$1\ell+2$ b-jets $+\not{E}_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}=0$ GeV
>600	95	[20] AAD	16AA	ATLS	3,4ℓ + $\not{E}_T$, Tn2n3A, $m_{\widetilde{\chi}_1^0}$=0GeV
>670	95	[20] AAD	16AA	ATLS	3,4ℓ+$\not{E}_T$,Tn2n3B,$m_{\widetilde{\chi}_1^0}<200$GeV
>250	95	[21] AAD	15BA	ATLS	$m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>380	95	[22] AAD	14H	ATLS	$\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0\rightarrow\tau^\pm\nu\widetilde{\chi}_1^0\tau^\pm\tau^\mp\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>700	95	[22] AAD	14H	ATLS	$\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0\rightarrow\ell^\pm\nu\widetilde{\chi}_1^0\ell^\pm\ell^\mp\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>345	95	[22] AAD	14H	ATLS	$\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0\rightarrow W\widetilde{\chi}_1^0 Z\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>148	95	[22] AAD	14H	ATLS	$\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0\rightarrow W\widetilde{\chi}_1^0 H\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>620	95	[23] AAD	14X	ATLS	$\geq 4\ell^\pm$, $\widetilde{\chi}_{2,3}^0\rightarrow\ell^\pm\ell^\mp\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}=0$ GeV
		[24] AAD	13	ATLS	$3\ell^\pm+\not{E}_T$, pMSSM, SMS
		[25] CHATRCHYAN	12BJ	CMS	≥ 2 ℓ, jets $+\not{E}_T$, $pp\rightarrow\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0$
> 62.4	95	[26] ABREU	00W	DLPH	$\widetilde{\chi}_2^0$, $1\leq\tan\beta\leq 40$, all Δm, all m_0
> 99.9	95	[26] ABREU	00W	DLPH	$\widetilde{\chi}_3^0$, $1\leq\tan\beta\leq 40$, all Δm, all m_0
> 116.0	95	[26] ABREU	00W	DLPH	$\widetilde{\chi}_4^0$, $1\leq\tan\beta\leq 40$, all Δm, all m_0
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>310	95	[27] AAD	20AN	ATLS	$2\gamma+\not{E}_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}$=0 GeV
none 180–355	95	[28] AAD	14G	ATLS	$\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0\rightarrow W\widetilde{\chi}_1^0 Z\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
		[29] KHACHATRY...	14I	CMS	$\widetilde{\chi}_2^0\rightarrow(Z,\ H)\widetilde{\chi}_1^0\ \widetilde{\ell}\ell$, simplified model
		[30] AAD	12AS	ATLS	$3\ell^\pm+\not{E}_T$, pMSSM
		[31] AAD	12T	ATLS	$\ell^\pm\ell^\pm+\not{E}_T$, $pp\rightarrow\widetilde{\chi}_1^\pm\widetilde{\chi}_2^0$

[1] AAD 20AN searched in 139 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two photons and missing transverse momentum. Events are further categorised in terms of lepton or jet multiplicity. No significant excess over the expected background is observed. Limits at 95% C.L. are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 11.

[2] AAD 20I reported on ATLAS searches for electroweak production in models with compressed mass spectra as Tchi1n2Ga. A dataset of $p p$ collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Constraints at 95% C.L. are placed in Higgsino models on the mass of the $\widetilde{\chi}^0_2$ (the $\widetilde{\chi}^\pm_1$ mass is halfway between the $\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_1$ masses) at 193 GeV for a mass splitting between $\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_1$ of 9.3 GeV and extend down to a mass splitting of 2.4 GeV at the LEP chargino mass limit. See their Fig. 14(a).

[3] AAD 20I reported on ATLAS searches for electroweak production in models with compressed mass spectra as Tchi1n2Fa. A dataset of $p p$ collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Constraints at 95% C.L. are placed in Wino-Bino models on the mass of the $\widetilde{\chi}^0_2$ (degenerate with $\widetilde{\chi}^\pm_1$) at 240 GeV for a mass splitting between $\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_1$ of 7 GeV and extend down to a mass splitting of 1.5 GeV at the LEP chargino mass limit of 92.4 GeV. See their Fig. 14(b,c).

[4] AAD 20K reported on a search for electroweak production in models with mass splittings near the electroweak scale as Tchi1n2F and exploiting three-lepton final state events with an emulated recursive jigsaw reconstruction method. The analysis uses a dataset of $p p$ collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1}. Exclusion limits at 95% C.L. are derived on next-to-lightest neutralinos and charginos with masses up to 345 GeV for a massless lightest neutralino, see their Fig. 7.

[5] AAD 20R searched for electroweak production in the model Tchi1n2E, selecting events with a pair of b-tagged jets consistent with those from a Higgs boson decay, either an electron or a muon from the W boson decay and $\not{E}_T$. The analysis uses a dataset of $p p$ collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1}. Exclusion limits at 95% C.L. are derived on next-to-lightest neutralinos and charginos with masses up to 740 GeV for a massless lightest neutralino, assuming pure wino cross-sections. See their Fig. 6.

[6] SIRUNYAN 20AU searched in 77.2 fb^{-1} of $p p$ collisions at $\sqrt{s}=13$ TeV for events containing one soft, hadronically decaying tau lepton, one energetic jet from initial-state radiation, and large $\not{E}_T$. No excess over the expected background is observed. Limits are derived on the wino mass in the Tchi1n2D simplified model, see their Figure 2.

[7] AABOUD 19AU searched in 36.1 fb^{-1} of $p p$ collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and next-to-lightest neutralinos decaying into lightest neutralinos and a W and a Higgs boson, respectively. Fully hadronic, semileptonic, diphoton, and multilepton (electrons, muons) final states with missing transverse momentum are considered in this search. Observations are consistent with the Standard Model expectations, and 95% confidence-level limits of up to 680 GeV on the chargino/next-to-lightest neutralino masses are set (Tchi1n2E model). See their Figure 14 for an overlay of exclusion contours from all searches.

[8] SIRUNYAN 19BU searched for pair production of gauginos via vector boson fusion assuming the gaugino spectrum is compressed, in 35.9 fb^{-1} of $p p$ collisions at $\sqrt{s}=13$ TeV. The final states explored included zero leptons plus two jets, one lepton plus two jets, and one hadronic tau plus two jets. A similar bound is obtained in the light slepton limit.

[9] AABOUD 18AY searched in 36.1 fb^{-1} of $p p$ collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and neutralinos as in Tchi1n2D models, in events characterised by the presence of at least two hadronically decaying tau leptons and large missing transverse energy. No significant deviation from the expected SM background is observed. Assuming decays via intermediate $\widetilde{\tau}_L$ and $m_{\widetilde{\chi}^\pm_1} = m_{\widetilde{\chi}^0_2}$, the observed limits rule out $\widetilde{\chi}^0_2$ masses up to 760 GeV for a massless $\widetilde{\chi}^0_1$. See their Fig.7 (right).

Interpretations are also provided in Fig 8 (bottom) for different assumptions on the ratio between $m_{\widetilde{\tau}}$ and $m_{\widetilde{\chi}^0_2} + m_{\widetilde{\chi}^0_1}$.

[10] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the next-to-lightest neutralino mass up to 1100 GeV for massless $\widetilde{\chi}^0_1$ in the Tchi1n2C simplified model exploiting the 3ℓ signature, see their Figure 8(c).

[11] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the next-to-lightest neutralino mass up to 580 GeV for massless $\widetilde{\chi}^0_1$ in the Tchi1n2F simplified model exploiting the 2ℓ+2 jets and 3ℓ signatures, see their Figure 8(d).

[12] AABOUD 18CK searched for events with at least 3 b-jets and large missing transverse energy in two datasets of pp collisions at $\sqrt{s} = 13$ TeV of 36.1 fb^{-1} and 24.3 fb^{-1} depending on the trigger requirements. The analyses aimed to reconstruct two Higgs bosons decaying to pairs of b-quarks. No significant excess above the Standard Model expectations is observed. Limits are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 15(a). Constraints are also presented as a function of the BR of Higgsino decaying into an higgs boson and a gravitino, see their Figure 15(b).

[13] AABOUD 18CO searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak production of mass-degenerate charginos and next-to-lightest neutralinos in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. The search channels are based on recursive jigsaw reconstruction. Limits are set on the next-to-lightest neutralinos mass up to 600 GeV for massless neutralinos in the Tchi1n2F simplified model exploiting the statistical combination of 2ℓ+2 jets and 3ℓ channels. Next-to-lightest neutralinos masses below 220 GeV are not excluded due to an excess of events above the SM prediction in the dedicated regions. See their Figure 13(d).

[14] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in Tchi1n2G higgsino models, and $\widetilde{\chi}^0_2$ masses are excluded up to 145 GeV for $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1} = 5$ GeV. The exclusion limits extend down to mass splittings of 2.5 GeV, see their Fig. 10 (top). Results are also interpreted in terms of exclusion bounds on the production cross-sections for the NUHM2 scenario as a function of the universal gaugino mass $m_{1/2}$ and $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1}$, see their Fig. 12.

[15] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in Tchi1n2F wino models, and $\widetilde{\chi}^0_2$ masses are excluded up to 175 GeV for $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1} = 10$ GeV. The exclusion limits extend down to mass splittings of 2 GeV, see their Fig. 10 (bottom). Results are also interpreted in terms of exclusion bounds on the production cross-sections for the NUHM2 scenario as a function of the universal gaugino mass $m_{1/2}$ and $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1}$, see their Fig. 12.

[16] AABOUD 18U searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV in events with at least one isolated photon, possibly jets and significant transverse momentum targeting generalised models of gauge-mediated SUSY breaking. No significant excess of events is observed above the SM prediction. Results of the diphoton channel are interpreted in

terms of lower limits on the masses of gauginos Tchi1chi1A models, which reach as high as 1.3 TeV. Gaugino masses below 1060 GeV are excluded for any NLSP mass, see their Fig. 10.

[17] SIRUNYAN 18AJ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two low-momentum, oppositely charged leptons (electrons or muons) and $\not{E}_T$. No excess over the expected background is observed. Limits are derived on the wino mass in the Tchi1n2F simplified model, see their Figure 5. Limits are also set on the stop mass in the Tstop10 simplified model, see their Figure 6. Finally, limits are set on the Higgsino mass in the Tchi1n2G simplified model, see Figure 8 and in the pMSSM, see Figure 7.

[18] SIRUNYAN 18DP searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos and neutralinos or of chargino pairs in events with a tau lepton pair and significant missing transverse momentum. Both hadronic and leptonic decay modes are considered for the tau lepton. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass in the Tchi1chi1D and Tchi1n2 simplified models, see their Figures 14 and 15. Also, excluded stau pair production cross sections are shown in Figures 11, 12, and 13.

[19] SIRUNYAN 17AW searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with a charged lepton (electron or muon), two jets identified as originating from a b-quark, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the mass of the chargino and the next-to-lightest neutralino in the Tchi1n2E simplified model, see their Figure 6.

[20] AAD 16AA summarized and extended ATLAS searches for electroweak supersymmetry in final states containing several charged leptons, $\not{E}_T$, with or without hadronic jets, in 20 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on mass-degenerate $\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_3$ masses in the Tn2n3A and Tn2n3B simplified models. See their Fig. 15.

[21] AAD 15BA searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for electroweak production of charginos and neutralinos decaying to a final state containing a W boson and a 125 GeV Higgs boson, plus missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of direct chargino and next-to-lightest neutralino production, with the decays $\widetilde{\chi}^\pm_1 \rightarrow W^\pm \widetilde{\chi}^0_1$ and $\widetilde{\chi}^0_2 \rightarrow H \widetilde{\chi}^0_1$ having 100% branching fraction, see Fig. 8. A combination of the multiple final states for the Higgs decay yields the best limits (Fig. 8d).

[22] AAD 14H searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of charginos and neutralinos decaying to a final sate with three leptons and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of direct chargino and next-to-lightest neutralino production, with decays to the lightest neutralino via either all three generations of leptons, staus only, gauge bosons, or Higgs bosons, see Fig. 7. An interpretation in the pMSSM is also given, see Fig. 8.

[23] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the neutralino mass in an R-parity conserving simplified model where the decay $\widetilde{\chi}^0_{2,3} \rightarrow \ell^\pm \ell^\mp \widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, see Fig. 10.

[24] AAD 13 searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for charginos and neutralinos decaying to a final state with three leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in the phenomenological MSSM, see Fig. 2 and 3, and in simplified models, see Fig. 4. For the simplified models with intermediate slepton decays, degenerate $\widetilde{\chi}^\pm_1$ and $\widetilde{\chi}^0_2$ masses up to 500 GeV are excluded at 95% C.L. for very large mass differences with the $\widetilde{\chi}^0_1$. Supersedes AAD 12AS.

[25] CHATRCHYAN 12BJ searched in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for direct electroweak production of charginos and neutralinos in events with at least two leptons, jets and missing transverse momentum. No significant excesses over the expected SM backgrounds are observed and 95% C.L. limits on the production cross section of $\widetilde{\chi}_1^\pm \widetilde{\chi}_2^0$ pair production were set in a number of simplified models, see Figs. 7 to 12. Most limits are for exactly 3 jets.

[26] ABREU 00W combines data collected at $\sqrt{s}$=189 GeV with results from lower energies. The mass limit is obtained by constraining the MSSM parameter space with gaugino and sfermion mass universality at the GUT scale, using the results of negative direct searches for neutralinos (including cascade decays and $\widetilde{\tau}\tau$ final states) from ABREU 01, for charginos from ABREU 00J and ABREU 00T (for all Δm_+), and for charged sleptons from ABREU 01B. The results hold for the full parameter space defined by all values of M_2 and $|\mu| \leq 2$ TeV with the $\widetilde{\chi}_1^0$ as LSP.

[27] AAD 20AN searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two photons and missing transverse momentum. Events are further categorised in terms of lepton or jet multiplicity. No significant excess over the expected background is observed. Limits at 95% C.L. are derived in Tchi1n2E simplified models. Next-to-lightest neutralinos and charginos with masses up to 310 GeV for a massless lightest neutralino are excluded. See their Fig. 10.

[28] AAD 14G searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for electroweak production of chargino-neutralino pairs, decaying to a final sate with two leptons (e and μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of chargino and next-to-lightest neutralino production, with decays to the lightest neutralino via gauge bosons, see Fig. 7. An interpretation in the pMSSM is also given, see Fig. 10.

[29] KHACHATRYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for electroweak production of charginos and neutralinos decaying to a final state with three leptons (e or μ) and missing transverse momentum, or with a Z-boson, dijets and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models, see Figs. 12–16.

[30] AAD 12AS searched in 2.06 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for charginos and neutralinos decaying to a final state with three leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in the phenomenological MSSM, see Fig. 2 (top), and in simplified models, see Fig. 2 (bottom).

[31] AAD 12T looked in 1 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for the production of supersymmetric particles decaying into final states with missing transverse momentum and exactly two isolated leptons (e or μ). Same-sign dilepton events were separately studied. Additionally, in opposite-sign events, a search was made for an excess of same-flavor over different-flavor lepton pairs. No excess over the expected background is observed and limits are placed on the effective production cross section of opposite-sign dilepton events with $\not{E}_T$ > 250 GeV and on same-sign dilepton events with $\not{E}_T$ > 100 GeV. The latter limit is interpreted in a simplified electroweak gaugino production model.

$\widetilde{\chi}_1^\pm$, $\widetilde{\chi}_2^\pm$ (Charginos) mass limits

Charginos are unknown mixtures of w-inos and charged higgsinos (the supersymmetric partners of W and Higgs bosons). A lower mass limit for the lightest chargino ($\widetilde{\chi}_1^\pm$) of approximately 45 GeV, independent of the field composition and of the decay mode, has been obtained by the LEP experiments from the analysis of the Z width and decays. These results, as well as other now superseded limits from e^+e^- collisions at energies below 136 GeV, and from hadronic collisions, can be found in the 1998 Edition (The European Physical Journal **C3** 1 (1998)) of this Review.

Unless otherwise stated, results in this section assume spectra, production rates, decay modes and branching ratios as evaluated in the MSSM, with gaugino and sfermion mass unification at the GUT scale. These papers generally study production of $\widetilde{\chi}^0_1 \widetilde{\chi}^0_2$, $\widetilde{\chi}^+_1 \widetilde{\chi}^-_1$ and (in the case of hadronic collisions) $\widetilde{\chi}^+_1 \widetilde{\chi}^0_2$ pairs, including the effects of cascade decays. The mass limits on $\widetilde{\chi}^\pm_1$ are either direct, or follow indirectly from the constraints set by the non-observation of $\widetilde{\chi}^0_2$ states on the gaugino and higgsino MSSM parameters M_2 and μ. For generic values of the MSSM parameters, limits from high-energy $e^+ e^-$ collisions coincide with the highest value of the mass allowed by phase-space, namely $m_{\widetilde{\chi}^\pm_1} \lesssim \sqrt{s}/2$. The still unpublished combination of the results of the four LEP collaborations from the 2000 run of LEP2 at $\sqrt{s}$ up to $\simeq$ 209 GeV yields a lower mass limit of 103.5 GeV valid for general MSSM models. The limits become however weaker in certain regions of the MSSM parameter space where the detection efficiencies or production cross sections are suppressed. For example, this may happen when: (i) the mass differences $\Delta m_+ = m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1}$ or $\Delta m_\nu = m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\nu}}$ are very small, and the detection efficiency is reduced; (ii) the electron sneutrino mass is small, and the $\widetilde{\chi}^\pm_1$ production rate is suppressed due to a destructive interference between s and t channel exchange diagrams. The regions of MSSM parameter space where the following limits are valid are indicated in the comment lines or in the footnotes.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>380	95	[1] AAD	20AN	ATLS	$2\gamma + \not{E}_T$,Tn1n1A, GMSB
>240	95	[2] AAD	20I	ATLS	2ℓ (soft), jets, $\not{E}_T$; Tchi1n2Fa, wino, $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} = 7$ GeV
>345	95	[3] AAD	20K	ATLS	$3\ell+\not{E}_T$, Tchi1n2F, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>420	95	[4] AAD	20O	ATLS	$2\ell+\not{E}_T$, Tchi1chi1H, $m_{\widetilde{\chi}^0_1}$=0 GeV
>1000	95	[5] AAD	20O	ATLS	$2\ell+\not{E}_T$, Tchi1chi1C, $m_{\widetilde{\chi}^0_1}$=0 GeV
>740	95	[6] AAD	20R	ATLS	1ℓ + $2b$-jets + $\not{E}_T$, Tchi1n2E, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>290	95	[7] SIRUNYAN	20AU	CMS	soft τ + jet + $\not{E}_T$, Tchi1n2D, wino, $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} = 50$ GeV
>1050	95	[8] SIRUNYAN	20B	CMS	$\geq 1\gamma + \not{E}_T$, Tchi1chi1F, $\widetilde{\chi}^0_1 \to \gamma \widetilde{G}$
>825	95	[8] SIRUNYAN	20B	CMS	$\geq 1\gamma + \not{E}_T$, Tchi1chi1G, $\widetilde{\chi}^\pm_1 \to \widetilde{\chi}^0_1$ + soft
>840	95	[8] SIRUNYAN	20B	CMS	$\geq 1\gamma + \not{E}_T$, Tchi1n12-GGM, 120 GeV $< m_{\widetilde{\chi}^0_1} <$ 720 GeV
>680	95	[9] AABOUD	19AU	ATL	0, 1, 2 or more ℓ, H ($\to \gamma\gamma$, $b b$, $W W^*$, $Z Z^*$,$\tau\tau$) (various searches), Tchi1n2E, $m_{\widetilde{\chi}^0_1}$=0 GeV

$>$ 112	95	[10] SIRUNYAN	19BU	CMS	$p p \to \widetilde{\chi}_1^+ \widetilde{\chi}_2^0$+2 jets, $\widetilde{\chi}_1^+ \to \ell^+ \nu \widetilde{\chi}_1^0$, heavy sleptons, $m_{\widetilde{\chi}_1^+} - m_{\widetilde{\chi}_1^0}$ = 1 GeV, $m_{\widetilde{\chi}_1^+} = m_{\widetilde{\chi}_2^0}$
$>$ 215	95	[10] SIRUNYAN	19BU	CMS	$p p \to \widetilde{\chi}_1^+ \widetilde{\chi}_2^0$ + 2 jets, $\widetilde{\chi}_1^+ \to \ell^+ \nu \widetilde{\chi}_1^0$, heavy sleptons, $m_{\widetilde{\chi}_1^+} - m_{\widetilde{\chi}_1^0}$ = 30 GeV, $m_{\widetilde{\chi}_1^+} = m_{\widetilde{\chi}_2^0}$
$>$ 235	95	[11] SIRUNYAN	19CI	CMS	$\geq$ 1 H ($\to \gamma\gamma$) + jets + $\not\!\!E_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
$>$ 930	95	[12] SIRUNYAN	19K	CMS	γ + lepton + $\not\!\!E_T$, Tchi1n1A
$>$ 630	95	[13] AABOUD	18AY	ATLS	2τ+$\not\!\!E_T$, Tchi1chi1D and $\widetilde{\tau}_L$-only, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 760	95	[14] AABOUD	18AY	ATLS	2τ+$\not\!\!E_T$, Tchi1n2D and $\widetilde{\tau}_L$-only, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 740	95	[15] AABOUD	18BT	ATLS	2ℓ+$\not\!\!E_T$, Tchi1chi1C, $m_{\widetilde{\chi}_1^0}$=0 GeV
$>$1125	95	[16] AABOUD	18BT	ATLS	2,3ℓ+$\not\!\!E_T$, Tchi1n2C, $m_{\widetilde{\chi}_1^0}$=0 GeV
$>$ 580	95	[17] AABOUD	18BT	ATLS	2,3ℓ+$\not\!\!E_T$, Tchi1n2F, $m_{\widetilde{\chi}_1^0}$=0 GeV
none 130–230, 290–880	95	[18] AABOUD	18CK	ATLS	2H ($\to b b$)+$\not\!\!E_T$,Tn1n1A, GMSB
none 220–600	95	[19] AABOUD	18CO	ATLS	2,3ℓ + $\not\!\!E_T$, recursive jigsaw, Tchi1n2F, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 175	95	[20] AABOUD	18R	ATLS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2F, wino, $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}$ = 10 GeV
$>$ 145	95	[21] AABOUD	18R	ATLS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2G, higgsino, $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}$ = 5 GeV
$>$1060	95	[22] AABOUD	18U	ATLS	2γ + $\not\!\!E_T$, GGM, Tchi1chi1A, any NLSP mass
$>$1400	95	[23] AABOUD	18Z	ATLS	$\geq$ 4ℓ, RPV, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}_1^0}$ $>$ 500 GeV
$>$1320	95	[23] AABOUD	18Z	ATLS	$\geq$ 4ℓ, RPV, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}_1^0}$ $>$ 50 GeV
$>$ 980	95	[23] AABOUD	18Z	ATLS	$\geq$ 4ℓ, RPV, $\lambda_{i33} \neq 0$, 400 GeV $<$ $m_{\widetilde{\chi}_1^0}$ $<$ 700 GeV
$>$ 980	95	[24] SIRUNYAN	18AA	CMS	$\geq$ 1γ + $\not\!\!E_T$, GGM, wino-like $\widetilde{\chi}_2^0 \widetilde{\chi}_1^\pm$ pair production, nearly degenerate wino and bino masses
$>$ 780	95	[24] SIRUNYAN	18AA	CMS	$\geq$ 1γ + $\not\!\!E_T$, Tchi1n1A
$>$ 950	95	[24] SIRUNYAN	18AA	CMS	$\geq$ 1γ + $\not\!\!E_T$, Tchi1chi1A
$>$ 230	95	[25] SIRUNYAN	18AJ	CMS	2ℓ (soft) + $\not\!\!E_T$, Tchi1n2F, wino, $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ = 20 GeV

>1150	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2A, $m_{\widetilde{\ell}} = m_{\widetilde{\nu}} = m_{\widetilde{\chi}^0_1} + 0.5\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>1120	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2A, $m_{\widetilde{\ell}} = m_{\widetilde{\nu}} = m_{\widetilde{\chi}^0_1} + 0.05\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>1050	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2A, $m_{\widetilde{\ell}} = m_{\widetilde{\nu}} = m_{\widetilde{\chi}^0_1} + 0.95\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>1080	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2H, $m_{\widetilde{\ell}} = m_{\widetilde{\chi}^0_1} + 0.5\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>1030	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2H, $m_{\widetilde{\ell}} = m_{\widetilde{\chi}^0_1} + 0.05\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>1050	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2H, $m_{\widetilde{\ell}} = m_{\widetilde{\chi}^0_1} + 0.95\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 625	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2D, $m_{\widetilde{\tau}} = m_{\widetilde{\chi}^0_1} + 0.5\,(m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1})$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 180	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2E, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 450	95	[26] SIRUNYAN	18AO	CMS	$\ell^\pm\ell^\pm$ or $\geq 3\ell$, Tchi1n2F, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 480	95	[27] SIRUNYAN	18AP	CMS	Combination of searches, Tchi1n2E, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 650	95	[27] SIRUNYAN	18AP	CMS	Combination of searches, Tchi1n2F, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 535	95	[27] SIRUNYAN	18AP	CMS	Combination of searches, Tchi1n2I, $m_{\widetilde{\chi}^0_1} = 0$ GeV
none 160–610	95	[28] SIRUNYAN	18AR	CMS	$\ell^\pm\ell^\mp$ + jets + $\not{E}_T$, Tchi1n2F, $m_{\widetilde{\chi}^0_1} = 0$ GeV
none 170–200	95	[29] SIRUNYAN	18DN	CMS	$\ell^\pm\ell^\mp$, Tchi1chi1E, $m_{\widetilde{\chi}^0_1} = 1$ GeV
> 810	95	[29] SIRUNYAN	18DN	CMS	$\ell^\pm\ell^\mp$, Tchi1chi1C, $m_{\widetilde{\chi}^0_1} = 0$ GeV
> 630	95	[30] SIRUNYAN	18DP	CMS	$2\tau+\not{E}_T$, Tchi1chi1D, $m_{\widetilde{\chi}^0_1}$=0 GeV
> 710	95	[30] SIRUNYAN	18DP	CMS	$2\tau+\not{E}_T$, Tchi1n2D, $m_{\widetilde{\chi}^0_1} = 0$ GeV

>170	95	[31] SIRUNYAN	18X	CMS	≥ 1 H ($\rightarrow \gamma\gamma$) + jets + $\not\!\!E_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0} < 25$ GeV
>420	95	[32] KHACHATRY...	17L	CMS	$2\tau+\not\!\!E_T$, Tchi1chi1C and $\widetilde{\tau}$-only, $m_{\widetilde{\chi}_1^0}$=0 GeV
none 220–490	95	[33] SIRUNYAN	17AW	CMS	1ℓ + 2b-jets + $\not\!\!E_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>500	95	[34] AAD	16AA	ATLS	$2\ell^{\pm}+\not\!\!E_T$,Tchi1chi1B,$m_{\widetilde{\chi}_1^0}$=0 GeV
>220	95	[34] AAD	16AA	ATLS	$2\ell^{\pm}+\not\!\!E_T$, Tchi1chi1C, low Δm for $\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^0$
>700	95	[35] AAD	16AA	ATLS	3,4$\ell+\not\!\!E_T$,Tchi1n2B, $m_{\widetilde{\chi}_1^0}$=0 GeV
>700	95	[35] AAD	16AA	ATLS	3,4$\ell+\not\!\!E_T$, Tchi1n2C, $m_{\widetilde{\ell}} = m_{\widetilde{\chi}_1^0}$+ 0.5 (or 0.95) ($m_{\widetilde{\chi}_1^{\pm}} - m_{\widetilde{\chi}_1^0}$)
>400	95	[35] AAD	16AA	ATLS	2 hadronic $\tau+\not\!\!E_T$ & $3\ell+\not\!\!E_T$ combination,Tchi1n2D,$m_{\widetilde{\chi}_1^0}$=0 GeV
>540	95	[36] KHACHATRY...	16R	CMS	$\geq 1\gamma$ + 1 e or μ + $\not\!\!E_T$, Tchi1n1A
>250	95	[37] AAD	15BA	ATLS	$m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>590	95	[38] AAD	15CA	ATLS	$\geq$ 2 γ + $\not\!\!E_T$, GGM, bino-like NLSP, any NLSP mass
none 124–361	95	[38] AAD	15CA	ATLS	$\geq$ 1 γ + e,μ + $\not\!\!E_T$, GGM, wino-like NLSP
>700	95	[39] AAD	14H	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0 \rightarrow \ell^{\pm}\nu\widetilde{\chi}_1^0\ell^{\pm}\ell^{\mp}\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>345	95	[39] AAD	14H	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0 \rightarrow W\widetilde{\chi}_1^0 Z\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>148	95	[39] AAD	14H	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0 \rightarrow W\widetilde{\chi}_1^0 H\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>380	95	[39] AAD	14H	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0 \rightarrow \tau^{\pm}\nu\widetilde{\chi}_1^0\tau^{\pm}\tau^{\mp}\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>750	95	[40] AAD	14X	ATLS	RPV, $\geq 4\ell^{\pm}$, $\widetilde{\chi}_1^{\pm} \rightarrow W^{(*)\pm}\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \rightarrow \ell^{\pm}\ell^{\mp}\nu$
>210	95	[41] KHACHATRY...	14L	CMS	$\widetilde{\chi}_2^0 \rightarrow H\widetilde{\chi}_1^0$ and $\widetilde{\chi}_1^{\pm} \rightarrow W^{\pm}\widetilde{\chi}_1^0$ simplified models, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^{\pm}}$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
		[42] AAD	13	ATLS	$3\ell^{\pm}$ + $\not\!\!E_T$, pMSSM, SMS
		[43] AAD	13B	ATLS	$2\ell^{\pm}$ + $\not\!\!E_T$, pMSSM, SMS
>540	95	[44] AAD	12CT	ATLS	$\geq 4\ell^{\pm}$, RPV, $m_{\widetilde{\chi}_1^0} > 300$ GeV
		[45] CHATRCHYAN	12BJ	CMS	$\geq$ 2 ℓ, jets + $\not\!\!E_T$, $pp \rightarrow \widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$

> 94	95	[46] ABDALLAH	03M	DLPH	$\widetilde{\chi}_1^{\pm}$, $\tan\beta \leq 40$, $\Delta m_+ > 3$ GeV,all m_0

• • • We do not use the following data for averages, fits, limits, etc. • • •

> 310	95	[47] AAD	20AN	ATLS	$2\gamma + \not{E}_T$, Tchi1n2E, $m_{\widetilde{\chi}_1^0}$=0 GeV
> 570	95	[48] KHACHATRY...	16AA	CMS	$\geq 1\gamma$ + jets + $\not{E}_T$, Tchi1chi1A
> 680	95	[48] KHACHATRY...	16AA	CMS	$\geq 1\gamma$ + jets + $\not{E}_T$, Tchi1n1A
> 710	95	[48] KHACHATRY...	16AA	CMS	$\geq 1\gamma$ + jets + $\not{E}_T$, GGM, $\widetilde{\chi}_2^0\widetilde{\chi}_1^{\pm}$ pair production, wino-like NLSP
>1000	95	[49] KHACHATRY...	16R	CMS	$\geq 1\gamma$ + 1 e or μ + $\not{E}_T$, Tglu1F, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0} > 200$ GeV
> 307	95	[50] KHACHATRY...	16Y	CMS	1,2 soft $\ell^{\pm}$+jets+$\not{E}_T$, Tchi1n2A, $m_{\widetilde{\chi}_1^{\pm}} - m_{\widetilde{\chi}_1^0}$=20 GeV
> 410	95	[51] AAD	14AV	ATLS	$\geq$ 2 τ + $\not{E}_T$, direct $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$, $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ production, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^{\pm}}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
> 345	95	[52] AAD	14AV	ATLS	$\geq 2\ \tau$ + $\not{E}_T$, direct $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ production, $m_{\widetilde{\chi}_1^0} = 0$ GeV
none 100–105, 120–135, 145–160	95	[53] AAD	14G	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp} \rightarrow W^+\widetilde{\chi}_1^0 W^-\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^0} = 0$ GeV
none 140–465	95	[53] AAD	14G	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp} \rightarrow \ell^+\nu\widetilde{\chi}_1^0\ell^-\overline{\nu}\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^0} = 0$ GeV
none 180–355	95	[53] AAD	14G	ATLS	$\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0 \rightarrow W\widetilde{\chi}_1^0 Z\widetilde{\chi}_1^0$, simplified model, $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
> 168	95	[54] AALTONEN	14	CDF	$3\ell^{\pm}$+ $\not{E}_T$, $\widetilde{\chi}_1^{\pm} \rightarrow \ell\nu\widetilde{\chi}_1^0$, mSUGRA with m_0=60 GeV
		[55] KHACHATRY...	14I	CMS	$\widetilde{\chi}_1^{\pm} \rightarrow W\widetilde{\chi}_1^0$, $\ell\widetilde{\nu}$, $\widetilde{\ell}\nu$, simplified model
		[56] AALTONEN	13Q	CDF	$\widetilde{\chi}_1^{\pm} \rightarrow \tau X$, simplified gravity- and gauge-mediated models
		[57] AAD	12AS	ATLS	$3\ell^{\pm}$ + $\not{E}_T$, pMSSM
		[58] AAD	12T	ATLS	$\ell^{\pm}\ell^{\mp}$ + $\not{E}_T$, $\ell^{\pm}\ell^{\pm}$ + $\not{E}_T$, $pp \rightarrow \widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$
		[59] CHATRCHYAN	11B	CMS	$\widetilde{W}^0 \rightarrow \gamma\widetilde{G}$,$\widetilde{W}^{\pm} \rightarrow \ell^{\pm}\widetilde{G}$,GMSB
> 163	95	[60] CHATRCHYAN	11V	CMS	$\tan\beta$=3, m_0=60 GeV, A_0=0, μ >0

[1] AAD 20AN searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two photons and missing transverse momentum. Events are further categorised in terms of lepton or jet multiplicity. No significant excess over the expected background is observed. Limits at 95% C.L. are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 11.

[2] AAD 20I reported on ATLAS searches for electroweak production in models with compressed mass spectra as Tchi1n2Fa. A dataset of pp collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Constraints at 95% C.L. are placed on the mass of the $\widetilde{\chi}_1^{\pm}$ (degenerate with $\widetilde{\chi}_2^0$) at 240 GeV for a mass splitting between $\widetilde{\chi}_1^{\pm}$ and $\widetilde{\chi}_1^0$ of 7 GeV and extend down to a mass splitting of 1.5 GeV at the LEP chargino mass limit of 92.4 GeV. See their Fig. 14(b,c).

[3] AAD 20K reported on a search for electroweak production in models with mass splittings near the electroweak scale as Tchi1n2F and exploiting three-lepton final state events with an emulated recursive jigsaw reconstruction method. The analysis uses a dataset of pp collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1}. Exclusion limits at 95% C.L. are derived on next-to-lightest neutralinos and charginos with masses up to 345 GeV for a massless lightest neutralino, see their Fig. 7.

[4] AAD 20O reported on a search for electroweak production in models with charginos and sleptons decaying into final states with exactly two oppositely charged leptons and missing transverse momentum. A dataset of pp collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Exclusion limits at 95% C.L. are derived on $m_{\widetilde{\chi}_1^{\pm}}$ decaying according to the Tchi1chi1H simplified model. Chargino masses up to 420 GeV are excluded for a massless lightest neutralino, see their Fig. 7(a).

[5] AAD 20O reported on a search for electroweak production in models with charginos and sleptons decaying into final states with exactly two oppositely charged leptons and missing transverse momentum. A dataset of pp collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Exclusion limits at 95% C.L. are derived on $m_{\widetilde{\chi}_1^{\pm}}$ decaying according to the Tchi1chi1C simplified model. Chargino masses up to 1000 GeV are excluded for a massless lightest neutralino, see their Fig. 7(b).

[6] AAD 20R searched for electroweak production in the model Tchi1n2E, selecting events with a pair of b-tagged jets consistent with those from a Higgs boson decay, either an electron or a muon from the W boson decay and $\not{E}_T$. The analysis uses a dataset of pp collisions at $\sqrt{s}=13$ TeV corresponding to an integrated luminosity of 139 fb^{-1}. Exclusion limits at 95% C.L. are derived on next-to-lightest neutralinos and charginos with masses up to 740 GeV for a massless lightest neutralino, assuming pure wino cross-sections. See their Fig. 6.

[7] SIRUNYAN 20AU searched in 77.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing one soft, hadronically decaying tau lepton, one energetic jet from initial-state radiation, and large $\not{E}_T$. No excess over the expected background is observed. Limits are derived on the wino mass in the Tchi1n2D simplified model, see their Figure 2.

[8] SIRUNYAN 20B searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least one photon and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on chargino masses in a general gauge-mediated SUSY breaking (GGM) scenario Tchi1n12-GGM, see Figure 4. Limits are also set on the NLSP mass in the Tchi1chi1F and Tchi1chi1G simplified models, see their Figure 5. Finally, limits are set on the gluino mass in the Tglu4A simplified model, see Figure 6.

[9] AABOUD 19AU searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and next-to-lightest neutralinos decaying into lightest neutralinos and a W, and a Higgs boson, respectively. Fully hadronic, semileptonic, diphoton, and multilepton (electrons, muons) final states with missing transverse momentum are considered in this search. Observations are consistent with the Standard Model expectations, and 95% confidence-level limits of up to 680 GeV on the chargino/next-to-lightest neutralino masses are set (Tchi1n2E model). See their Figure 14 for an overlay of exclusion contours from all searches.

[10] SIRUNYAN 19BU searched for pair production of gauginos via vector boson fusion assuming the gaugino spectrum is compressed, in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV. The final states explored included zero leptons plus two jets, one lepton plus two

jets, and one hadronic tau plus two jets. A similar bound is obtained in the light slepton limit.

[11] SIRUNYAN 19CI searched in 77.5 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model, see Figure 3, and on the wino mass in the Tchi1n2E simplified model, see their Figure 4. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 5.

[12] SIRUNYAN 19K searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with a photon, an electron or muon, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the chargino and neutralino mass in the Tchi1n1A simplified model, see their Figure 6. Limits are also set on the gluino mass in the Tglu4A simplified model, and on the squark mass in the Tsqk4A simplified model, see their Figure 7.

[13] AABOUD 18AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos as in Tchi1chi1D models in events characterised by the presence of at least two hadronically decaying tau leptons and large missing transverse energy. No significant deviation from the expected SM background is observed. In the Tchi1chi1D model, assuming decays via intermediate $\widetilde{\tau}_L$, the observed limits rule out $\widetilde{\chi}_1^\pm$ masses up to 630 GeV for a massless $\widetilde{\chi}_1^0$. See their Fig.7 (left). Interpretations are also provided in Fig 8 (top) for different assumptions on the ratio between $m_{\widetilde{\tau}}$ and $m_{\widetilde{\chi}_1^\pm}$ + $m_{\widetilde{\chi}_1^0}$.

[14] AABOUD 18AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and neutralinos as in Tchi1n2D models, in events characterised by the presence of at least two hadronically decaying tau leptons and large missing transverse energy. No significant deviation from the expected SM background is observed. Assuming decays via intermediate $\widetilde{\tau}_L$ and $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_2^0}$, the observed limits rule out $\widetilde{\chi}_1^\pm$ masses up to 760 GeV for a massless $\widetilde{\chi}_1^0$. See their Fig.7 (right). Interpretations are also provided in Fig 8 (bottom) for different assumptions on the ratio between $m_{\widetilde{\tau}}$ and $m_{\widetilde{\chi}_1^\pm}+m_{\widetilde{\chi}_1^0}$.

[15] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass up to 750 GeV for massless neutralinos in the Tchi1chi1C simplified model exploiting 2ℓ + 0 jets signatures, see their Figure 8(a).

[16] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass up to 1100 GeV for massless neutralinos in the Tchi1n2C simplified model exploiting 3ℓ signature, see their Figure 8(c).

[17] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass up to 580 GeV for massless neutralinos in the Tchi1n2F simplified model exploiting 2ℓ+2 jets and 3ℓ signatures, see their Figure 8(d).

[18] AABOUD 18CK searched for events with at least 3 b-jets and large missing transverse energy in two datasets of pp collisions at $\sqrt{s}=13$ TeV of 36.1 fb^{-1} and 24.3 fb^{-1} depending on the trigger requirements. The analyses aimed to reconstruct two Higgs

bosons decaying to pairs of b-quarks. No significant excess above the Standard Model expectations is observed. Limits are set on the Higgsino mass in the T1n1n1A simplified model, see their Figure 15(a). Constraints are also presented as a function of the BR of Higgsino decaying into an higgs boson and a gravitino, see their Figure 15(b).

[19] AABOUD 18CO searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of mass-degenerate charginos and next-to-lightest neutralinos in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. The search channels are based on recursive jigsaw reconstruction. Limits are set on the chargino mass up to 600 GeV for massless neutralinos in the Tchi1n2F simplified model exploiting the statistical combination of 2ℓ+2 jets and 3ℓ channels. Chargino masses below 220 GeV are not excluded due to an excess of events above the SM prediction in the dedicated regions. See their Figure 13(d).

[20] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in Tchi1n2G wino models and $\widetilde{\chi}_1^\pm$ masses are excluded up to 175 GeV for $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}$ = 10 GeV. The exclusion limits extend down to mass splittings of 2 GeV, see their Fig. 10 (bottom).

[21] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in Tchi1n2G higgsino models and $\widetilde{\chi}_1^\pm$ masses are excluded up to 145 GeV for $m_{\widetilde{\chi}_1^\pm}$ - $m_{\widetilde{\chi}_1^0}$ = 5 GeV. The exclusion limits extend down to mass splittings of 2.5 GeV, see their Fig. 10 (top).

[22] AABOUD 18U searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in events with at least one isolated photon, possibly jets and significant transverse momentum targeting generalised models of gauge-mediated SUSY breaking. No significant excess of events is observed above the SM prediction. Results of the diphoton channel are interpreted in terms of lower limits on the masses of gauginos Tchi1chi1A models, which reach as high as 1.3 TeV. Gaugino masses below 1060 GeV are excluded for any NLSP mass, see their Fig. 10.

[23] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[24] SIRUNYAN 18AA searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one photon and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in a general gauge-mediated SUSY breaking (GGM) scenario with bino-like $\widetilde{\chi}_1^0$ and wino-like $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$, see Figure 7. Limits are also set on the NLSP mass in the Tchi1n1A and Tchi1chi1A simplified models, see their Figure 8. Finally, limits are set on the gluino mass in the Tglu4A and Tglu4B simplified models, see their Figure 9, and on the squark mass in the Tskq4A and Tsqk4B simplified models, see their Figure 10.

[25] SIRUNYAN 18AJ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two low-momentum, oppositely charged leptons (electrons or muons) and $\not\!\!E_T$. No excess over the expected background is observed. Limits are derived on the wino mass in the Tchi1n2F simplified model, see their Figure 5. Limits are also set on the stop mass in the Tstop10 simplified model, see their Figure 6. Finally, limits are set on the Higgsino mass in the Tchi1n2G simplified model, see Figure 8 and in the pMSSM, see Figure 7.

[26] SIRUNYAN 18AO searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct electroweak production of charginos and neutralinos in events with either two or more leptons

(electrons or muons) of the same electric charge, or with three or more leptons, which can include up to two hadronically decaying tau leptons. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino/neutralino mass in the Tchi1n2A, Tchi1n2H, Tchi1n2D, Tchi1n2E and Tchi1n2F simplified models, see their Figures 14, 15, 16, 17 and 18. Limits are also set on the higgsino mass in the Tn1n1A, Tn1n1B and Tn1n1C simplified models, see their Figure 19.

[27] SIRUNYAN 18AP searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos and neutralinos by combining a number of previous and new searches. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino/neutralino mass in the Tchi1n2E, Tchi1n2F and Tchi1n2I simplified models, see their Figures 7, 8, 9 an 10. Limits are also set on the higgsino mass in the Tn1n1A, Tn1n1B and Tn1n1C simplified models, see their Figure 11, 12, 13 and 14.

[28] SIRUNYAN 18AR searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two opposite-charge, same-flavour leptons (electrons or muons), jets and $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4C simplified model, see their Figure 7. Limits are also set on the chargino/neutralino mass in the Tchi1n2F simplified models, see their Figure 8, and on the higgsino mass in the Tn1n1B and Tn1n1C simplified models, see their Figure 9. Finally, limits are set on the sbottom mass in the Tsbot3 simplified model, see their Figure 10.

[29] SIRUNYAN 18DN searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos and for pair production of top squarks in events with two leptons (electrons or muons) of the opposite electric charge. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass in the Tchi1chi1C and Tchi1chi1E simplified models, see their Figure 8. Limits are also set on the stop mass in the Tstop1 and Tstop2 simplified models, see their Figure 9.

[30] SIRUNYAN 18DP searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos and neutralinos or of chargino pairs in events with a tau lepton pair and significant missing transverse momentum. Both hadronic and leptonic decay modes are considered for the tau lepton. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass in the Tchi1chi1D and Tchi1n2 simplified models, see their Figures 14 and 15. Also, excluded stau pair production cross sections are shown in Figures 11, 12, and 13.

[31] SIRUNYAN 18X searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not\!\!E_T$. The razor variables (M_R and R^2) are used to categorise the events. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model and on the wino mass in the Tchi1n2E simplified model, see their Figure 5. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 6.

[32] KHACHATRYAN 17L searched in about 19 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two τ (at least one decaying hadronically) and $\not\!\!E_T$. In the Tchi1chi1C model, assuming decays via intermediate $\widetilde{\tau}$ or $\widetilde{\nu}_\tau$ with equivalent mass, the observed limits rule out $\widetilde{\chi}_1^\pm$ masses up to 420 GeV for a massless $\widetilde{\chi}_1^0$. See their Fig.5.

[33] SIRUNYAN 17AW searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with a charged lepton (electron or muon), two jets identified as originating from a b-quark, and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the mass of the chargino and the next-to-lightest neutralino in the Tchi1n2E simplified model, see their Figure 6.

[34] AAD 16AA summarized and extended ATLAS searches for electroweak supersymmetry in final states containing several charged leptons, $\not\!\!E_T$, with or without hadronic jets, in 20 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on the $\widetilde{\chi}_1^\pm$ mass in the Tchi1chi1B and Tchi1chi1C simplified models. See their Fig. 13.

[35] AAD 16AA summarized and extended ATLAS searches for electroweak supersymmetry in final states containing several charged leptons, $\not\!\!E_T$, with or without hadronic jets, in 20 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on mass-degenerate $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$ masses in the Tchi1n2B, Tchi1n2C, and Tchi1n2D simplified models. See their Figs. 16, 17, and 18. Interpretations in phenomenological-MSSM, two-parameter Non Universal Higgs Masses (NUHM2), and gauge-mediated symmetry breaking (GMSB) models are also given in their Figs. 20, 21 and 22.

[36] KHACHATRYAN 16R searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with one or more photons, one electron or muon, and $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in a general gauge-mediated SUSY breaking model (GGM), for a wino-like neutralino NLSP scenario, see Fig. 5. Limits are also set in the Tglu1D and Tchi1n1A simplified models, see Fig. 6. The Tchi1n1A limit is reduced to 340 GeV for a branching ratio reduced by the weak mixing angle.

[37] AAD 15BA searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of charginos and neutralinos decaying to a final state containing a W boson and a 125 GeV Higgs boson, plus missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of direct chargino and next-to-lightest neutralino production, with the decays $\widetilde{\chi}_1^\pm \rightarrow W^\pm \widetilde{\chi}_1^0$ and $\widetilde{\chi}_2^0 \rightarrow H \widetilde{\chi}_1^0$ having 100% branching fraction, see Fig. 8. A combination of the multiple final states for the Higgs decay yields the best limits (Fig. 8d).

[38] AAD 15CA searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with one or more photons and $\not\!\!E_T$, with or without leptons (e, μ). No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in the general gauge-mediated SUSY breaking model (GGM), for wino-like NLSP, see Fig. 9, 12

[39] AAD 14H searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of charginos and neutralinos decaying to a final sate with three leptons and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of direct chargino and next-to-lightest neutralino production, with decays to the lightest neutralino via either all three generations of leptons, staus only, gauge bosons, or Higgs bosons, see Fig. 7. An interpretation in the pMSSM is also given, see Fig. 8.

[40] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the wino-like chargino mass in an R-parity violating simplified model where the decay $\widetilde{\chi}_1^\pm \rightarrow W^{(*)\pm} \widetilde{\chi}_1^0$, with $\widetilde{\chi}_1^0 \rightarrow \ell^\pm \ell^\mp \nu$, takes place with a branching ratio of 100%, see Fig. 8.

[41] KHACHATRYAN 14L searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for evidence of chargino-neutralino $\widetilde{\chi}_1^\pm \widetilde{\chi}_2^0$ pair production with Higgs or W-bosons in the decay chain, leading to HW final states with missing transverse energy. The decays of a Higgs boson to a photon pair are considered in conjunction with hadronic and leptonic decay modes of the W bosons. No significant excesses over the expected SM backgrounds are observed. The results are interpreted in the context of simplified models where the decays $\widetilde{\chi}_2^0 \rightarrow H \widetilde{\chi}_1^0$ and $\widetilde{\chi}_1^\pm \rightarrow W^\pm \widetilde{\chi}_1^0$ take place 100% of the time, see Figs. 22–23.

[42] AAD 13 searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for charginos and neutralinos decaying to a final state with three leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in the phenomenological MSSM, see Fig. 2 and 3, and in simplified models, see Fig. 4. For the simplified models with intermediate slepton decays, degenerate $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$ masses up to 500 GeV are excluded at 95% C.L. for very large mass differences with the $\widetilde{\chi}_1^0$. Supersedes AAD 12AS.

[43] AAD 13B searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for gauginos decaying to a final state with two leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Limits are derived in a simplified model of wino-like chargino pair production, where the chargino always decays to the lightest neutralino via an intermediate on-shell charged slepton, see Fig. 2(b). Chargino masses between 110 and 340 GeV are excluded at 95% C.L. for $m_{\widetilde{\chi}_1^0}=10$ GeV. Exclusion limits are also derived in the phenomenological MSSM, see Fig. 3.

[44] AAD 12CT searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events containing four or more leptons (electrons or muons) and either moderate values of missing transverse momentum or large effective mass. No significant excess is found in the data. Limits are presented in a simplified model of R-parity violating supersymmetry in which charginos are pair-produced and then decay into a W-boson and a $\widetilde{\chi}_1^0$, which in turn decays through an RPV coupling into two charged leptons ($e^\pm e^\mp$ or $e^\pm \mu^\mp$) and a neutrino. In this model, chargino masses up to 540 GeV are excluded at 95% C.L. for $m_{\widetilde{\chi}_1^0}$ above 300 GeV, see Fig. 3a. The limit deteriorates for lighter $\widetilde{\chi}_1^0$. Limits are also set in an R-parity violating mSUGRA model, see Fig. 3b.

[45] CHATRCHYAN 12BJ searched in 4.98 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for direct electroweak production of charginos and neutralinos in events with at least two leptons, jets and missing transverse momentum. No significant excesses over the expected SM backgrounds are observed and 95% C.L. limits on the production cross section of $\widetilde{\chi}_1^\pm \widetilde{\chi}_2^0$ pair production were set in a number of simplified models, see Figs. 7 to 12.

[46] ABDALLAH 03M uses data from $\sqrt{s}=$ 192–208 GeV to obtain limits in the framework of the MSSM with gaugino and sfermion mass universality at the GUT scale. An indirect limit on the mass of charginos is derived by constraining the MSSM parameter space by the results from direct searches for neutralinos (including cascade decays), for charginos and for sleptons. These limits are valid for values of $M_2 < 1$ TeV, $|\mu| \leq 2$ TeV with the $\widetilde{\chi}_1^0$ as LSP. Constraints from the Higgs search in the m_h^{max} scenario assuming $m_t=$ 174.3 GeV are included. The quoted limit applies if there is no mixing in the third family or when $m_{\widetilde{\tau}_1} - m_{\widetilde{\chi}_1^0} > 6$ GeV. If mixing is included the limit degrades to 90 GeV. See Fig. 43 for the mass limits as a function of tanβ. These limits update the results of ABREU 00W.

[47] AAD 20AN searched in 139 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two photons and missing transverse momentum. Events are further categorised in terms of lepton or jet multiplicity. No significant excess over the expected background is observed. Limits at 95% C.L. are derived in Tchi1n2E simplified models. Next-to-lightest neutralinos and charginos with masses up to 310 GeV for a massless lightest neutralino are excluded. See their Fig. 10.

[48] KHACHATRYAN 16AA searched in 7.4 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with one or more photons, hadronic jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in the general gauge-mediated SUSY breaking model (GGM), for a wino-like neutralino NLSP scenario and with the wino mass fixed at 10 GeV above the bino mass, see Fig. 4. Limits are also set in the Tchi1chi1A and Tchi1n1A simplified models, see Fig. 3.

[49] KHACHATRYAN 16R searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with one or more photons, one electron or muon, and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are also set in the Tglu1F simplified model, see Fig. 6.

[50] KHACHATRYAN 16Y searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with one or two soft isolated leptons, hadronic jets, and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the $\widetilde{\chi}_1^\pm$ mass (which is degenerate with the $\widetilde{\chi}_2^0$) in the Tchi1n2A simplified model, see Fig. 4.

[51] AAD 14AV searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for the direct production of charginos, neutralinos and staus in events containing at last two hadronically decaying

τ-leptons, large missing transverse momentum and low jet activity. The quoted limit was derived for direct $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$ and $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ production with $\widetilde{\chi}_2^0 \to \widetilde{\tau}\tau \to \tau\tau\widetilde{\chi}_1^0$ and $\widetilde{\chi}_1^{\pm} \to \widetilde{\tau}\nu(\widetilde{\nu}_\tau\tau) \to \tau\nu\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^{\pm}}$, $m_{\widetilde{\tau}} = 0.5$ ($m_{\widetilde{\chi}_1^{\pm}} + m_{\widetilde{\chi}_1^0}$), $m_{\widetilde{\chi}_1^0} = 0$ GeV. No excess over the expected SM background is observed. Exclusion limits are set in simplified models of $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ and $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$ pair production, see their Figure 7. Upper limits on the cross section and signal strength for direct di-stau production are derived, see Figures 8 and 9. Also, limits are derived in a pMSSM model where the only light slepton is the $\widetilde{\tau}_R$, see Figure 10.

[52] AAD 14AV searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for the direct production of charginos, neutralinos and staus in events containing at last two hadronically decaying τ-leptons, large missing transverse momentum and low jet activity. The quoted limit was derived for direct $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ production with $\widetilde{\chi}_1^{\pm} \to \widetilde{\tau}\nu(\widetilde{\nu}_\tau\tau) \to \tau\nu\widetilde{\chi}_1^0$, $m_{\widetilde{\tau}} = 0.5$ ($m_{\widetilde{\chi}_1^{\pm}} + m_{\widetilde{\chi}_1^0}$), $m_{\widetilde{\chi}_1^0} = 0$ GeV. No excess over the expected SM background is observed. Exclusion limits are set in simplified models of $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_1^{\mp}$ and $\widetilde{\chi}_1^{\pm}\widetilde{\chi}_2^0$ pair production, see their Figure 7. Upper limits on the cross section and signal strength for direct di-stau production are derived, see Figures 8 and 9. Also, limits are derived in a pMSSM model where the only light slepton is the $\widetilde{\tau}_R$, see Figure 10.

[53] AAD 14G searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of chargino pairs, or chargino-neutralino pairs, decaying to a final sate with two leptons (e and μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of chargino pair production, with chargino decays to the lightest neutralino via either sleptons or gauge bosons, see Fig 5.; or in simplified models of chargino and next-to-lightest neutralino production, with decays to the lightest neutralino via gauge bosons, see Fig. 7. An interpretation in the pMSSM is also given, see Fig. 10.

[54] AALTONEN 14 searched in 5.8 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for evidence of chargino and next-to-lightest neutralino associated production in final states consisting of three leptons (electrons, muons or taus) and large missing transverse momentum. The results are consistent with the Standard Model predictions within 1.85 σ. Limits on the chargino mass are derived in an mSUGRA model with $m_0 = 60$ GeV, tan$\beta = 3$, $A_0 = 0$ and $\mu > 0$, see their Fig. 2.

[55] KHACHATRYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of chargino pairs decaying to a final state with opposite-sign lepton pairs (e or μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models, see Fig. 18.

[56] AALTONEN 13Q searched in 6.0 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for evidence of chargino-neutralino associated production in like-sign dilepton final states. One lepton is identified as the hadronic decay of a tau lepton, while the other is an electron or muon. Good agreement with the Standard Model predictions is observed and limits are set on the chargino-neutralino cross section for simplified gravity- and gauge-mediated models, see their Figs. 2 and 3.

[57] AAD 12AS searched in 2.06 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for charginos and neutralinos decaying to a final state with three leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in the phenomenological MSSM, see Fig. 2 (top), and in simplified models, see Fig. 2 (bottom).

[58] AAD 12T looked in 1 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for the production of supersymmetric particles decaying into final states with missing transverse momentum and exactly two isolated leptons (e or μ). Opposite-sign and same-sign dilepton events were separately studied. Additionally, in opposite-sign events, a search was made for an excess of same-flavor over different-flavor lepton pairs. No excess over the expected background is observed and limits are placed on the effective production cross section of opposite-sign dilepton events with $\not{E}_T > 250$ GeV and on same-sign dilepton events

with $\not\!\!E_T$ > 100 GeV. The latter limit is interpreted in a simplified electroweak gaugino production model as a lower chargino mass limit.

[59] CHATRCHYAN 11B looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$=7 TeV for events with an isolated lepton (e or μ), a photon and $\not\!\!E_T$ which may arise in a generalized gauge mediated model from the decay of Wino-like NLSPs. No evidence for an excess over the expected background is observed. Limits are derived in the plane of squark/gluino mass versus Wino mass (see Fig. 4). Mass degeneracy of the produced squarks and gluinos is assumed.

[60] CHATRCHYAN 11V looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with $\geq$ 3 isolated leptons (e, μ or τ), with or without jets and $\not\!\!E_T$. No evidence for an excess over the expected background is observed. Limits are derived in the CMSSM (m_0, $m_{1/2}$) plane for tanβ = 3 (see Fig. 5).

Long-lived $\widetilde{\chi}^{\pm}$ (Chargino) mass limit

Limits on charginos which leave the detector before decaying.

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
> 884	95	[1] SIRUNYAN	20N	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, wino LSP, AMSB, tan$\beta$ = 5, μ > 0, τ = 3 ns
> 474	95	[1] SIRUNYAN	20N	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, wino LSP, AMSB, tan$\beta$ = 5, μ > 0, τ = 0.2 ns
> 750	95	[1] SIRUNYAN	20N	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, higgsino LSP, AMSB, tanβ=5, μ >0,τ=3ns
> 175	95	[1] SIRUNYAN	20N	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, higgsino LSP, AMSB, tanβ=5,μ >0,τ=0.05ns
>1090	95	[2] AABOUD	19AT	ATLS	long-lived $\widetilde{\chi}^{\pm}_1$ mAMSB
> 460	95	[3] AABOUD	18AS	ATLS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, lifetime 0.2 ns, $m_{\widetilde{\chi}^{\pm}} - m_{\widetilde{\chi}^0_1}$ = 160 MeV
> 715	95	[4] SIRUNYAN	18BR	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, AMSB, tan$\beta$ = 5 and μ > 0, τ = 3 ns
> 695	95	[4] SIRUNYAN	18BR	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, AMSB, tan$\beta$ = 5 and μ > 0, τ = 7 ns
> 505	95	[4] SIRUNYAN	18BR	CMS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, AMSB, tan$\beta$ = 5, μ > 0, 0.5 ns > τ > 60 ns
> 620	95	[5] AAD	15AE	ATLS	stable $\widetilde{\chi}^{\pm}$
> 534	95	[6] AAD	15BM	ATLS	stable $\widetilde{\chi}^{\pm}$
> 239	95	[6] AAD	15BM	ATLS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, lifetime 1 ns, $m_{\widetilde{\chi}^{\pm}} - m_{\widetilde{\chi}^0_1}$ = 0.14 GeV
> 482	95	[6] AAD	15BM	ATLS	$\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, lifetime 15 ns, $m_{\widetilde{\chi}^{\pm}} - m_{\widetilde{\chi}^0_1}$ = 0.14 GeV
> 103	95	[7] AAD	13H	ATLS	long-lived $\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$, mAMSB, $\Delta m_{\widetilde{\chi}^0_1}$ = 160 MeV
> 92	95	[8] AAD	12BJ	ATLS	long-lived $\widetilde{\chi}^{\pm} \rightarrow \pi^{\pm} \widetilde{\chi}^0_1$, mAMSB
> 171	95	[9] ABAZOV	09M	D0	$\widetilde{H}$
> 102	95	[10] ABBIENDI	03L	OPAL	$m_{\widetilde{\nu}}$ >500 GeV
none 2–93.0	95	[11] ABREU	00T	DLPH	$\widetilde{H}^{\pm}$ or $m_{\widetilde{\nu}} > m_{\widetilde{\chi}^{\pm}}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
> 260	95	[12] KHACHATRY...	15AB	CMS	$\widetilde{\chi}^{\pm}_1 \rightarrow \widetilde{\chi}^0_1 \pi^{\pm}$,$\tau_{\widetilde{\chi}^{\pm}_1}$=0.2ns, AMSB
> 800	95	[13] KHACHATRY...	15AO	CMS	long-lived $\widetilde{\chi}^{\pm}_1$, mAMSB, τ >100ns

>100	95	[13] KHACHATRY...15AO	CMS	long-lived $\widetilde{\chi}_1^{\pm}$, mAMSB, $\tau > 3$ ns
	95	[14] KHACHATRY...15W	CMS	long-lived $\widetilde{\chi}^0$, $\widetilde{q} \rightarrow q\widetilde{\chi}^0$, $\widetilde{\chi}^0 \rightarrow \ell^+\ell^-\nu$, RPV
>270	95	[15] AAD	13BD ATLS	disappearing-track signature, AMSB
>278	95	[16] ABAZOV	13B D0	long-lived $\widetilde{\chi}^{\pm}$, gaugino-like
>244	95	[16] ABAZOV	13B D0	long-lived $\widetilde{\chi}^{\pm}$, higgsino-like

[1] SIRUNYAN 20N searched in 101 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of long-lived charginos in events containing isolated tracks with missing hits in the outer layer of the silicon tracker and little or no associated calorimetric energy deposits (disappearing tracks). No significant excess above the Standard Model expectations is observed. In an AMSB context and assuming a wino LSP, limits are set on the cross section of direct chargino production through $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}^{\mp}$ and $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}_1^0$, assuming B($\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}_1^0\pi^{\pm}$) = 100%, as a function of the chargino mass and mean proper lifetime, see Figure 2. In the case of a Higgsino LSP, limits are set on the cross section of direct chargino production through $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}^{\mp}$ and $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}_{1,2}^0$, assuming B($\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}_1^0\pi^{\pm}$) = 95.5%, B($\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}_1^0 e^{\pm}$) = 3%, B($\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}_1^0\mu^{\pm}$) = 1.5%, as a function of the chargino mass and mean proper lifetime, see Figure 3.

[2] AABOUD 19AT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for metastable R-hadrons. Multiple search strategies for a wide range of lifetimes, corresponding to path lengths of a few meters, are defined. No significant deviations from the expected Standard Model background are observed. Results are interpreted in terms of direct electroweak production of long-lived charginos in the context of mAMSB scenarios. Chargino masses are excluded at 95% C.L. below 1090 GeV. See their Figure 10 (right).

[3] AABOUD 18AS searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of long-lived charginos in the context of AMSB or phenomenological MSSM scenarios with wino-like LSP. Events with a disappearing track due to a low-momentum pion accompanied by at least one jet with high transverse momentum from initial-state radiation are considered. No significant excess above the Standard Model expectations is observed. Exclusion limits are set at 95% confidence level on the mass of charginos for different chargino lifetimes. For a pure wino with a lifetime of about 0.2 ns, corresponding to a mass-splitting between the charged and neutral wino of around 160 MeV, chargino masses up to 460 GeV are excluded, see their Fig. 8.

[4] SIRUNYAN 18BR searched in 38.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of long-lived charginos in events containing isolated tracks with missing hits in the outer layer of the silicon tracker and little or no associated calorimetric energy deposits (disappearing tracks). No significant excess above the Standard Model expectations is observed. In an AMSB context, limits are set on the cross section of direct chargino production through $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}^{\mp}$ and $pp \rightarrow \widetilde{\chi}^{\pm}\widetilde{\chi}_1^0$, assuming BR($\widetilde{\chi}^{\pm} \rightarrow \widetilde{\chi}_1^0\pi^{\pm}$) = 100%, as a function of the chargino mass and mean proper lifetime, see Figures 3, 4 and 5.

[5] AAD 15AE searched in 19.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for heavy long-lived charged particles, measured through their specific ionization energy loss in the ATLAS pixel detector or their time-of-flight in the ALTAS muon system. In the absence of an excess of events above the expected backgrounds, limits are set on stable charginos, see Fig. 10.

[6] AAD 15BM searched in 18.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for stable and metastable non-relativistic charged particles through their anomalous specific ionization energy loss in the ATLAS pixel detector. In absence of an excess of events above the expected backgrounds, limits are set on stable charginos (see Table 5) and on metastable charginos decaying to $\widetilde{\chi}_1^0\pi^{\pm}$, see Fig. 11.

[7] AAD 13H searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for direct electroweak production of long-lived charginos in the context of AMSB scenarios. The search is based on the signature of a high-momentum isolated track with few associated hits in

the outer part of the tracking system, arising from a chargino decay into a neutralino and a low-momentum pion. The p_T spectrum of the tracks was found to be consistent with the SM expectations. Constraints on the lifetime and the production cross section were obtained, see Fig. 6. In the minimal AMSB framework with tan$\beta = 5$, and $\mu > 0$, a chargino having a mass below 103 (85) GeV for a chargino-neutralino mass splitting $\Delta m_{\widetilde{\chi}_1^0}$ of 160 (170) MeV is excluded at the 95% C.L. See Fig. 7 for more precise bounds.

[8] AAD 12BJ looked in 1.02 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for signatures of decaying charginos resulting in isolated tracks with few associated hits in the outer region of the tracking system. The p_T spectrum of the tracks was found to be consistent with the SM expectations. Constraints on the lifetime and the production cross section were obtained. In the minimal AMSB framework with $m_{3/2} < 32$ TeV, $m_0 < 1.5$ TeV, tan$\beta = 5$, and $\mu > 0$, a chargino having a mass below 92 GeV and a lifetime between 0.5 ns and 2 ns is excluded at the 95% C.L. See their Fig. 8 for more precise bounds.

[9] ABAZOV 09M searched in 1.1 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for events with direct production of a pair of charged massive stable particles identified by their TOF. The number of the observed events is consistent with the predicted background. The data are used to constrain the production cross section as a function of the $\widetilde{\chi}_1^\pm$ mass, see their Fig. 2. The quoted limit improves to 206 GeV for gaugino-like charginos.

[10] ABBIENDI 03L used e^+e^- data at $\sqrt{s} = 130$–209 GeV to select events with two high momentum tracks with anomalous dE/dx. The excluded cross section is compared to the theoretical expectation as a function of the heavy particle mass in their Fig. 3. The bounds are valid for colorless fermions with lifetime longer than 10^{-6} s. Supersedes the results from ACKERSTAFF 98P.

[11] ABREU 00T searches for the production of heavy stable charged particles, identified by their ionization or Cherenkov radiation, using data from $\sqrt{s}$= 130 to 189 GeV. These limits include and update the results of ABREU 98P.

[12] KHACHATRYAN 15AB searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing tracks with little or no associated calorimeter energy deposits and with missing hits in the outer layers of the tracking system (disappearing-track signature). Such disappearing tracks can result from the decay of charginos that are nearly mass degenerate with the lightest neutralino. The number of observed events is in agreement with the background expectation. Limits are set on the cross section of electroweak chargino production in terms of the chargino mass and mean proper lifetime, see Fig. 4. In the minimal AMSB model, a chargino mass below 260 GeV is excluded at 95% C.L., see their Fig. 5.

[13] KHACHATRYAN 15O searched in 18.8 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for evidence of long-lived charginos in the context of AMSB and pMSSM scenarios. The results are based on a previously published search for heavy stable charged particles at 7 and 8 TeV. In the minimal AMSB framework with tan$\beta = 5$ and $\mu \geq 0$, constraints on the chargino mass and lifetime were placed, see Fig. 5. Charginos with a mass below 800 (100) GeV are excluded at the 95% C.L. for lifetimes above 100 ns (3 ns). Constraints are also placed on the pMSSM parameter space, see Fig. 3.

[14] KHACHATRYAN 15W searched in up to 20.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for evidence of long-lived neutralinos produced through $\widetilde{q}$-pair production, with $\widetilde{q} \rightarrow q\widetilde{\chi}^0$ and $\widetilde{\chi}^0 \rightarrow \ell^+\ell^-\nu$ (RPV: λ_{121}, $\lambda_{122} \neq 0$). 95% C.L. exclusion limits on cross section times branching ratio are set as a function of mean proper decay length of the neutralino, see Figs. 6 and 9.

[15] AAD 13BD searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing tracks with no associated hits in the outer region of the tracking system resulting from the decay of charginos that are nearly mass degenerate with the lightest neutralino, as is often the case in AMSB scenarios. No significant excess above the background expectation is observed for candidate tracks with large transverse momentum. Constraints on chargino properties are obtained and in the minimal AMSB model, a chargino mass below 270 GeV is excluded at 95% C.L., see their Fig. 7.

[16] ABAZOV 13B looked in 6.3 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for charged massive long-lived particles in events with muon-like particles that have both speed and ionization

energy loss inconsistent with muons produced in beam collisions. In the absence of an excess, limits are set at 95% C.L. on gaugino- and higgsino-like charginos, see their Table 20 and Fig. 23.

$\widetilde{\nu}$ (Sneutrino) mass limit

The limits may depend on the number, $N(\widetilde{\nu})$, of sneutrinos assumed to be degenerate in mass. Only $\widetilde{\nu}_L$ (not $\widetilde{\nu}_R$) is assumed to exist. It is possible that $\widetilde{\nu}$ could be the lightest supersymmetric particle (LSP).

We report here, but do not include in the Listings, the limits obtained from the fit of the final results obtained by the LEP Collaborations on the invisible width of the Z boson ($\Delta\Gamma_{\text{inv.}} < 2.0$ MeV, LEP-SLC 06): $m_{\widetilde{\nu}} > 43.7$ GeV ($N(\widetilde{\nu})$=1) and $m_{\widetilde{\nu}} > 44.7$ GeV ($N(\widetilde{\nu})$=3) .

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>3400	95	[1] AABOUD	18CM	ATLS	RPV, $\widetilde{\nu}_\tau \to e\mu$, $\lambda_{312} = \lambda_{321} = 0.07$, $\lambda'_{311} = 0.11$
>2900	95	[2] AABOUD	18CM	ATLS	RPV, $\widetilde{\nu}_\tau \to e\tau$, $\lambda_{313} = \lambda_{331} = 0.07$, $\lambda'_{311} = 0.11$
>2600	95	[3] AABOUD	18CM	ATLS	RPV, $\widetilde{\nu}_\tau \to \mu\tau$, $\lambda_{323} = \lambda_{332} = 0.07$, $\lambda'_{311} = 0.11$
>1060	95	[4] AABOUD	18Z	ATLS	RPV, $\geq 4\ell$, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}^0_1} = 600$ GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
> 780	95	[4] AABOUD	18Z	ATLS	RPV, $\geq 4\ell$, $\lambda_{i33} \neq 0$, $m_{\widetilde{\chi}^0_1} = 300$ GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
>1700	95	[5] SIRUNYAN	18AT	CMS	RPV, $\widetilde{\nu}_\tau \to e\mu$, $\lambda_{132} = \lambda_{231} = \lambda'_{311} = 0.01$
>3800	95	[5] SIRUNYAN	18AT	CMS	RPV, $\widetilde{\nu}_\tau \to e\mu$, $\lambda_{132} = \lambda_{231} = \lambda'_{311} = 0.1$
>2300	95	[6] AABOUD	16P	ATLS	RPV, $\widetilde{\nu}_\tau \to e\mu$, $\lambda'_{311} = 0.11$
>2200	95	[6] AABOUD	16P	ATLS	RPV, $\widetilde{\nu}_\tau \to e\tau$, $\lambda'_{311} = 0.11$
>1900	95	[6] AABOUD	16P	ATLS	RPV, $\widetilde{\nu}_\tau \to \mu\tau$, $\lambda'_{311} = 0.11$
> 400	95	[7] AAD	14X	ATLS	RPV, $\geq 4\ell^\pm$, $\widetilde{\nu} \to \nu\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \to \ell^\pm\ell^\mp\nu$
		[8] AAD	11Z	ATLS	RPV, $\widetilde{\nu}_\tau \to e\mu$
> 94	95	[9] ABDALLAH	03M	DLPH	$1 \leq \tan\beta \leq 40$, $m_{\widetilde{e}_R} - m_{\widetilde{\chi}^0_1} >10$ GeV
> 84	95	[10] HEISTER	02N	ALEP	$\widetilde{\nu}_e$, any Δm
> 41	95	[11] DECAMP	92	ALEP	$\Gamma(Z \to \text{invisible})$; $N(\widetilde{\nu})$=3, model independent

• • • We do not use the following data for averages, fits, limits, etc. • • •

		[12] SIRUNYAN	19AO		RPV, $\mu^{\pm}\mu^{\pm}+\ \geq$ 2jets, $\lambda'_{211}\neq 0$, $\widetilde{\nu}_{\mu}\rightarrow \mu\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm}\rightarrow \mu q\overline{q}q\overline{q}$
$>$1280	95	[13] KHACHATRY...	16BE	CMS	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$, $\lambda_{132}=\lambda_{231}=\lambda'_{311}=0.01$
$>$2300	95	[13] KHACHATRY...	16BE	CMS	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$, $\lambda_{132}=\lambda_{231}=0.07$, $\lambda'_{311}=0.11$
$>$2000	95	[14] AAD	15O	ATLS	RPV ($e\mu$), $\widetilde{\nu}_{\tau}$, $\lambda'_{311}=0.11$, $\lambda_{i3k}=0.07$
$>$1700	95	[14] AAD	15O	ATLS	RPV ($\tau\mu$, $e\tau$), $\widetilde{\nu}_{\tau}$, $\lambda'_{311}=0.11$, $\lambda_{i3k}=0.07$
		[15] AAD	13AI	ATLS	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$, $e\tau$, $\mu\tau$
		[16] AAD	11H	ATLS	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$
		[17] AALTONEN	10Z	CDF	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$, $e\tau$, $\mu\tau$
		[18] ABAZOV	10M	D0	RPV, $\widetilde{\nu}_{\tau}\rightarrow e\mu$
$>$ 95	95	[19] ABDALLAH	04H	DLPH	AMSB, $\mu>0$
$>$ 37.1	95	[20] ADRIANI	93M	L3	$\Gamma(Z\rightarrow$ invisible); $N(\widetilde{\nu})$=1
$>$ 36	95	ABREU	91F	DLPH	$\Gamma(Z\rightarrow$ invisible); $N(\widetilde{\nu})$=1
$>$ 31.2	95	[21] ALEXANDER	91F	OPAL	$\Gamma(Z\rightarrow$ invisible); $N(\widetilde{\nu})$=1

[1] AABOUD 18CM searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for heavy particles decaying into an $e\mu$, $e\tau$, $\mu\tau$ final state. No significant deviation from the expected SM background is observed. Limits are set on the mass of a stau neutrino with R-parity-violating couplings. For $\widetilde{\nu}_{\tau}\rightarrow e\mu$, masses below 3.4 TeV are excluded at 95% CL, see their Figure 4(b). Upper limits on the RPV couplings $|\lambda_{312}|$ versus $|\lambda'_{311}|$ are also performed, see their Figure 8(a-b).

[2] AABOUD 18CM searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for heavy particles decaying into an $e\mu$, $e\tau$, $\mu\tau$ final state. No significant deviation from the expected SM background is observed. Limits are set on the mass of a stau neutrino with R-parity-violating couplings. For $\widetilde{\nu}_{\tau}\rightarrow e\tau$, masses below 2.9 TeV are excluded at 95% CL, see their Figure 5(b). Upper limits on the RPV couplings $|\lambda_{313}|$ versus $|\lambda'_{311}|$ are also performed, see their Figure 8(c).

[3] AABOUD 18CM searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for heavy particles decaying into an $e\mu$, $e\tau$, $\mu\tau$ final state. No significant deviation from the expected SM background is observed. Limits are set on the mass of a stau neutrino with R-parity-violating couplings. For $\widetilde{\nu}_{\tau}\rightarrow \mu\tau$, masses below 2.6 TeV are excluded at 95% CL, see their Figure 6(b). Upper limits on the RPV couplings $|\lambda_{323}|$ versus $|\lambda'_{311}|$ are also performed, see their Figure 8(d).

[4] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[5] SIRUNYAN 18AT searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for heavy resonances decaying into $e\mu$ final states. No significant excess above the Standard Model expectation is observed and 95% C.L. exclusions are placed on the cross section times branching ratio for the R-parity-violating production and decay of a supersymmetric tau sneutrino, see their Fig. 3.

[6] AABOUD 16P searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with different flavour dilepton pairs ($e\mu$, $e\tau$, $\mu\tau$) from the production of $\widetilde{\nu}_\tau$ via an RPV λ'_{311} coupling and followed by a decay via $\lambda_{312} = \lambda_{321} = 0.07$ for $e+\ \mu$, via $\lambda_{313} = \lambda_{331}$ = 0.07 for $e+\ \tau$ and via $\lambda_{323} = \lambda_{332} = 0.07$ for $\mu+\ \tau$. No evidence for a dilepton resonance over the SM expectation is observed, and limits are derived on $m_{\widetilde{\nu}}$ at 95% CL, see their Figs. 2(b), 3(b), 4(b), and Table 3.

[7] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the sneutrino mass in an R-parity violating simplified model where the decay $\widetilde{\nu} \rightarrow\ \nu\widetilde{\chi}^0_1$, with $\widetilde{\chi}^0_1 \rightarrow\ \ell^\pm\ell^\mp\nu$, takes place with a branching ratio of 100%, see Fig. 9.

[8] AAD 11Z looked in 1.07 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with one electron and one muon of opposite charge from the production of $\widetilde{\nu}_\tau$ via an RPV λ'_{311} coupling and followed by a decay via λ_{312} into $e+\ \mu$. No evidence for an (e, μ) resonance over the SM expectation is observed, and a limit is derived in the plane of λ'_{311} versus $m_{\widetilde{\nu}}$ for three values of λ_{312}, see their Fig. 2. Masses $m_{\widetilde{\nu}}$ < 1.32 (1.45) TeV are excluded for $\lambda'_{311} = 0.10$ and $\lambda_{312} = 0.05$ ($\lambda'_{311} = 0.11$ and $\lambda_{312} = 0.07$).

[9] ABDALLAH 03M uses data from $\sqrt{s}$ = 192–208 GeV to obtain limits in the framework of the MSSM with gaugino and sfermion mass universality at the GUT scale. An indirect limit on the mass is derived by constraining the MSSM parameter space by the results from direct searches for neutralinos (including cascade decays) and for sleptons. These limits are valid for values of $M_2 < 1$ TeV, $|\mu| \leq 1$ TeV with the $\widetilde{\chi}^0_1$ as LSP. The quoted limit is obtained when there is no mixing in the third family. See Fig. 43 for the mass limits as a function of tanβ. These limits update the results of ABREU 00W.

[10] HEISTER 02N derives a bound on $m_{\widetilde{\nu}_e}$ by exploiting the mass relation between the $\widetilde{\nu}_e$ and $\widetilde{e}$, based on the assumption of universal GUT scale gaugino and scalar masses $m_{1/2}$ and m_0 and the search described in the $\widetilde{e}$ section. In the MSUGRA framework with radiative electroweak symmetry breaking, the limit improves to $m_{\widetilde{\nu}_e}$ >130 GeV, assuming a trilinear coupling A_0=0 at the GUT scale. See Figs. 5 and 7 for the dependence of the limits on tanβ.

[11] DECAMP 92 limit is from Γ(invisible)/Γ($\ell\ell$) = 5.91 ± 0.15 (N_ν = 2.97 ± 0.07).

[12] SIRUNYAN 19AO searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two same-sign muons and at last two jets, originating from resonant production of second-generation sleptons ($\widetilde{\mu}_L$, $\widetilde{\nu}_\mu$) via the R-parity violating coupling λ'_{211} to quarks. No significant excess above the Standard Model expectations is observed. Upper limits on cross sections are derived in the context of two simplified models, see their Figure 4. The cross section limits are translated into limits on λ'_{211} for a modified CMSSM, see their Figure 5.

[13] KHACHATRYAN 16BE searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of narrow resonances decaying into $e\mu$ final states. No significant excess above the Standard Model expectation is observed and 95% C.L. exclusions are placed on the cross section times branching ratio for the production of an R-parity-violating supersymmetric tau sneutrino, see their Fig. 3.

[14] AAD 15O searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of heavy particles decaying into $e\mu$, $e\tau$ or $\mu\tau$ final states. No significant excess above the Standard Model expectation is observed, and 95% C.L. exclusions are placed on the cross section times branching ratio for the production of an R-parity-violating supersymmetric tau sneutrino, applicable to any sneutrino flavour, see their Fig. 2.

[15] AAD 13AI searched in 4.6 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for evidence of heavy particles decaying into $e\mu$, $e\tau$ or $\mu\tau$ final states. No significant excess above the Standard Model expectation is observed, and 95% C.L. exclusions are placed on the cross section times branching ratio for the production of an R-parity-violating supersymmetric tau

sneutrino, see their Fig. 2. For couplings $\lambda'_{311} = 0.10$ and $\lambda_{i3k} = 0.05$, the lower limits on the $\widetilde{\nu}_\tau$ mass are 1610, 1110, 1100 GeV in the $e\mu$, $e\tau$, and $\mu\tau$ channels, respectively.

[16] AAD 11H looked in 35 pb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events with one electron and one muon of opposite charge from the production of $\widetilde{\nu}_\tau$ via an RPV λ'_{311} coupling and followed by a decay via λ_{312} into $e + \mu$. No evidence for an excess over the SM expectation is observed, and a limit is derived in the plane of λ'_{311} versus $m_{\widetilde{\nu}}$ for several values of λ_{312}, see their Fig. 2. Superseded by AAD 11Z.

[17] AALTONEN 10Z searched in 1 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for events from the production $d\overline{d} \to \widetilde{\nu}_\tau$ with the subsequent decays $\widetilde{\nu}_\tau \to e\mu$, $\mu\tau$, $e\tau$ in the MSSM framework with RPV. Two isolated leptons of different flavor and opposite charges are required, with τs identified by their hadronic decay. No statistically significant excesses are observed over the SM background. Upper limits on λ'^2_{311} times the branching ratio are listed in their Table III for various $\widetilde{\nu}_\tau$ masses. Limits on the cross section times branching ratio for $\lambda'_{311} = 0.10$ and $\lambda_{i3k} = 0.05$, displayed in Fig. 2, are used to set limits on the $\widetilde{\nu}_\tau$ mass of 558 GeV for the $e\mu$, 441 GeV for the $\mu\tau$ and 442 GeV for the $e\tau$ channels.

[18] ABAZOV 10M looked in 5.3 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for events with exactly one pair of high p_T isolated $e\mu$ and a veto against hard jets. No evidence for an excess over the SM expectation is observed, and a limit at 95% C.L. on the cross section times branching ratio is derived, see their Fig. 3. These limits are translated into limits on couplings as a function of $m_{\widetilde{\nu}_\tau}$ as shown on their Fig. 4. As an example, for $m_{\widetilde{\nu}_\tau} =$ 100 GeV and $\lambda_{312} \leq 0.07$, couplings $\lambda'_{311} > 7.7 \times 10^{-4}$ are excluded.

[19] ABDALLAH 04H use data from LEP 1 and $\sqrt{s}$ = 192–208 GeV. They re-use results or re-analyze the data from ABDALLAH 03M to put limits on the parameter space of anomaly-mediated supersymmetry breaking (AMSB), which is scanned in the region $1< m_{3/2} <50$ TeV, $0< m_0 <1000$ GeV, $1.5<\tan\beta <35$, both signs of μ. The constraints are obtained from the searches for mass degenerate chargino and neutralino, for SM-like and invisible Higgs, for leptonically decaying charginos and from the limit on non-SM Z width of 3.2 MeV. The limit is for m_t = 174.3 GeV (see Table 2 for other m_t values). The limit improves to 114 GeV for $\mu < 0$.

[20] ADRIANI 93M limit from $\Delta\Gamma(Z)$(invisible)$<$ 16.2 MeV.

[21] ALEXANDER 91F limit is for one species of $\widetilde{\nu}$ and is derived from Γ(invisible, new)/$\Gamma(\ell\ell)$ $<$ 0.38.

Charged sleptons

This section contains limits on charged scalar leptons ($\widetilde{\ell}$, with ℓ=e,μ,τ). Studies of width and decays of the Z boson (use is made here of $\Delta\Gamma_{\rm inv} <$ 2.0 MeV, LEP 00) conclusively rule out $m_{\widetilde{\ell}_R} <$ 40 GeV (41 GeV for $\widetilde{\ell}_L$) , independently of decay modes, for each individual slepton. The limits improve to 43 GeV (43.5 GeV for $\widetilde{\ell}_L$) assuming all 3 flavors to be degenerate. Limits on higher mass sleptons depend on model assumptions and on the mass splitting $\Delta m = m_{\widetilde{\ell}} - m_{\widetilde{\chi}^0_1}$. The mass and composition of $\widetilde{\chi}^0_1$ may affect the selectron production rate in e^+e^- collisions through t-channel exchange diagrams. Production rates are also affected by the potentially large mixing angle of the lightest mass eigenstate $\widetilde{\ell}_1$=$\widetilde{\ell}_R \sin\theta_\ell$ + $\widetilde{\ell}_L \cos\theta_\ell$. It is generally assumed that only $\widetilde{\tau}$ may have significant mixing. The coupling to the Z vanishes for θ_ℓ=0.82. In the high-energy limit of e^+e^- collisions the interference between γ and Z exchange leads to a minimal cross section for θ_ℓ=0.91, a value which is sometimes used in the following entries relative to data taken at LEP2. When limits on $m_{\widetilde{\ell}_R}$ are quoted, it is understood that limits on $m_{\widetilde{\ell}_L}$ are usually at least as strong.

Possibly open decays involving gauginos other than $\widetilde{\chi}^0_1$ will affect the detection efficiencies. Unless otherwise stated, the limits presented here result from the study of $\widetilde{\ell}^+\widetilde{\ell}^-$ production, with production rates and decay properties derived from the MSSM. Limits made obsolete by the recent analyses of e^+e^- collisions at high energies can be found in previous Editions of this Review.

For decays with final state gravitinos ($\widetilde{G}$), $m_{\widetilde{G}}$ is assumed to be negligible relative to all other masses.

R-parity conserving $\widetilde{e}$ (Selectron) mass limit

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>700	95	[1] AAD	20O	ATLS	$2\ell+\not{E}_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}^0_1}$=0 GeV
>250	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $\widetilde{e}_R$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>310	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $\widetilde{e}_L$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>350	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $m_{\widetilde{e}_R} = m_{\widetilde{e}_L}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>290	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $\widetilde{\ell}_R$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>400	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $\widetilde{\ell}_L$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>450	95	[2] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not{E}_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
>500	95	[3] AABOUD	18BT	ATLS	$2\ell + \not{E}_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $\widetilde{\tau}$, with $m_{\widetilde{\chi}^0_1} = 0$ GeV
>190	95	[4] AABOUD	18R	ATLS	2ℓ (soft) $+ \not{E}_T$, $m_{\widetilde{e}} = m_{\widetilde{\mu}}$, $m_{\widetilde{e}} - m_{\widetilde{\chi}^0_1} = 5$ GeV
		[5] CHATRCHYAN	14R	CMS	$\geq 3\ell^\pm$, $\widetilde{\ell} \to \ell^\pm\tau^\mp\tau^\mp\widetilde{G}$ simplified model, GMSB, stau (N)NLSP scenario
		[6] AAD	13B	ATLS	$2\ell^\pm + \not{E}_T$, SMS, pMSSM
> 97.5		[7] ABBIENDI	04	OPAL	$\widetilde{e}_R$,$\Delta m > 11$ GeV, $\lvert\mu\rvert >$100 GeV, $\tan\beta$=1.5
> 94.4		[8] ACHARD	04	L3	$\widetilde{e}_R$,$\Delta m > 10$ GeV, $\lvert\mu\rvert >$200 GeV, $\tan\beta \geq 2$
> 71.3		[8] ACHARD	04	L3	$\widetilde{e}_R$, all Δm
none 30–94	95	[9] ABDALLAH	03M	DLPH	$\Delta m >$15 GeV, $\widetilde{e}^+_R\widetilde{e}^-_R$
> 94	95	[10] ABDALLAH	03M	DLPH	$\widetilde{e}_R$,$1 \leq \tan\beta \leq 40$, $\Delta m >$10 GeV

$>$ 95	95	[11] HEISTER	02E	ALEP	$\Delta m > 15$ GeV, $\widetilde{e}^+_R \widetilde{e}^-_R$
$>$ 73	95	[12] HEISTER	02N	ALEP	$\widetilde{e}_R$, any Δm
>107	95	[12] HEISTER	02N	ALEP	$\widetilde{e}_L$, any Δm

• • • We do not use the following data for averages, fits, limits, etc. • • •

>101	95	[13] AAD	20I	ATLS	2ℓ (soft), jets, $\not{E}_T$, $\widetilde{e}_R$ only, $m_{\widetilde{e}_R} - m_{\widetilde{\chi}^0_1} = 7.5$ GeV
>169	95	[14] AAD	20I	ATLS	2ℓ (soft), jets, $\not{E}_T$, $\widetilde{e}_L$ only, $m_{\widetilde{e}_L} - m_{\widetilde{\chi}^0_1} = 7.1$ GeV
none 90–325	95	[15] AAD	14G	ATLS	$\widetilde{\ell}\widetilde{\ell} \rightarrow \ell^+ \widetilde{\chi}^0_1 \ell^- \widetilde{\chi}^0_1$, simplified model, $m_{\widetilde{\ell}_L} = m_{\widetilde{\ell}_R}$, $m_{\widetilde{\chi}^0_1} =$ 0 GeV
		[16] KHACHATRY...	14I	CMS	$\widetilde{\ell} \rightarrow \ell \widetilde{\chi}^0_1$, simplified model

[1] AAD 20O reported on a search for electroweak production in models with charginos and sleptons decaying into final states with exactly two oppositely charged leptons and missing transverse momentum. A dataset of pp collisions at $\sqrt{s} = 13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 700 GeV for massless lightest neutralino, see their Fig. 7(c). Exclusion limits are also set for selectrons and smuons separately, considering either right- or left-handed components, by including only the di-electron and di-muon same-flavour signal regions defined in the search, see their Fig. 8.

[2] SIRUNYAN 19AW searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak pair production of selectrons or smuons in events with two leptons (electrons or muons) of the opposite electric charge and same flavour, no jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the selectron mass assuming left-handed, right-handed or both left- and right-handed (mass degenerate) production, see their Figure 6. Similarly, limits are set on the smuon mass, see their Figure 7. Limits are also set on slepton masses under the assumption that the selectron and smuon are mass degenerate, see their Figure 5.

[3] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass up to 500 GeV for massless $\widetilde{\chi}^0_1$, assuming degeneracy of $\widetilde{e}$, $\widetilde{\mu}$, and $\widetilde{\tau}$ and exploiting the 2ℓ signature, see their Figure 8(b).

[4] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in slepton pair production models with a fourfold degeneracy assumed in selectron and smuon masses. The $\widetilde{e}$ masses are excluded up to 190 GeV for $m_{\widetilde{e}} - m_{\widetilde{\chi}^0_1} = 5$ GeV. The exclusion limits extend down to mass splittings of 1 GeV, see their Fig. 11.

[5] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass in a stau (N)NLSP simplified model (GMSB) where the decay $\widetilde{\ell} \rightarrow \ell^{\pm} \tau^{\pm} \tau^{\mp} \widetilde{G}$ takes place with a branching ratio of 100%, see Fig. 8.

[6] AAD 13B searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for sleptons decaying to a final state with two leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Limits are derived in a simplified model of direct left-handed slepton pair production, where left-handed slepton masses between 85 and 195 GeV are excluded at 95% C.L. for $m_{\widetilde{\chi}^0_1} = 20$ GeV. See also Fig. 2(a). Exclusion limits are also derived in the phenomenological MSSM, see Fig. 3.

[7] ABBIENDI 04 search for $\widetilde{e}_R \widetilde{e}_R$ production in acoplanar di-electron final states in the 183–208 GeV data. See Fig. 13 for the dependence of the limits on $m_{\widetilde{\chi}^0_1}$ and for the limit at tanβ=35 This limit supersedes ABBIENDI 00G.

[8] ACHARD 04 search for $\widetilde{e}_R \widetilde{e}_L$ and $\widetilde{e}_R \widetilde{e}_R$ production in single- and acoplanar di-electron final states in the 192–209 GeV data. Absolute limits on $m_{\widetilde{e}_R}$ are derived from a scan over the MSSM parameter space with universal GUT scale gaugino and scalar masses $m_{1/2}$ and m_0, $1 \leq \tan\beta \leq 60$ and $-2 \leq \mu \leq 2$ TeV. See Fig. 4 for the dependence of the limits on $m_{\widetilde{\chi}^0_1}$. This limit supersedes ACCIARRI 99W.

[9] ABDALLAH 03M looked for acoplanar dielectron $+\not{E}$ final states at $\sqrt{s}$ = 189–208 GeV. The limit assumes μ=$-$200 GeV and tanβ=1.5 in the calculation of the production cross section and B($\widetilde{e} \rightarrow e \widetilde{\chi}^0_1$). See Fig. 15 for limits in the ($m_{\widetilde{e}_R}$, $m_{\widetilde{\chi}^0_1}$) plane. These limits include and update the results of ABREU 01

[10] ABDALLAH 03M uses data from $\sqrt{s}$ = 192–208 GeV to obtain limits in the framework of the MSSM with gaugino and sfermion mass universality at the GUT scale. An indirect limit on the mass is derived by constraining the MSSM parameter space by the results from direct searches for neutralinos (including cascade decays) and for sleptons. These limits are valid for values of M_2 <1 TeV, $|\mu| \leq 1$ TeV with the $\widetilde{\chi}^0_1$ as LSP. The quoted limit is obtained when there is no mixing in the third family. See Fig. 43 for the mass limits as a function of tanβ. These limits update the results of ABREU 00W.

[11] HEISTER 02E looked for acoplanar dielectron + $\not{E}_T$ final states from $e^+ e^-$ interactions between 183 and 209 GeV. The mass limit assumes $\mu < -200$ GeV and tanβ=2 for the production cross section and B($\widetilde{e} \rightarrow e \widetilde{\chi}^0_1$)=1. See their Fig. 4 for the dependence of the limit on Δm. These limits include and update the results of BARATE 01.

[12] HEISTER 02N search for $\widetilde{e}_R \widetilde{e}_L$ and $\widetilde{e}_R \widetilde{e}_R$ production in single- and acoplanar di-electron final states in the 183–208 GeV data. Absolute limits on $m_{\widetilde{e}_R}$ are derived from a scan over the MSSM parameter space with universal GUT scale gaugino and scalar masses $m_{1/2}$ and m_0, $1 \leq \tan\beta \leq 50$ and $-10 \leq \mu \leq 10$ TeV. The region of small $|\mu|$, where cascade decays are important, is covered by a search for $\widetilde{\chi}^0_1 \widetilde{\chi}^0_3$ in final states with leptons and possibly photons. Limits on $m_{\widetilde{e}_L}$ are derived by exploiting the mass relation between the $\widetilde{e}_L$ and $\widetilde{e}_R$, based on universal m_0 and $m_{1/2}$. When the constraint from the mass limit of the lightest Higgs from HEISTER 02 is included, the bounds improve to $m_{\widetilde{e}_R}$ >77(75) GeV and $m_{\widetilde{e}_L}$ >115(115) GeV for a top mass of 175(180) GeV. In the MSUGRA framework with radiative electroweak symmetry breaking, the limits improve further to $m_{\widetilde{e}_R}$ >95 GeV and $m_{\widetilde{e}_L}$ >152 GeV, assuming a trilinear coupling A_0=0 at the GUT scale. See Figs. 4, 5, 7 for the dependence of the limits on tanβ.

[13] AAD 20I reported on ATLAS searches for slepton pair production in models with compressed mass spectra. A dataset of pp collisions at $\sqrt{s}$ = 13 TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 251 GeV for a mass splitting slepton$-\widetilde{\chi}^0_1$ of 10 GeV, with constraints extending down to mass splittings of 550 MeV at the LEP slepton limits (73 GeV), see their Fig. 16(a). If only selectrons are considered, and $\widetilde{e} = \widetilde{e}_R$, masses below 101 GeV are excluded for mass splitting $\widetilde{e}_R$, $\widetilde{\chi}^0_1$ of 7.5 GeV. See their Fig. 16(b).

[14] AAD 20I reported on ATLAS searches for slepton pair production in models with compressed mass spectra. A dataset of pp collisions at $\sqrt{s}$ = 13 TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $E\!\!\!/_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 251 GeV for a mass splitting slepton$-\widetilde{\chi}^0_1$ of 10 GeV, with constraints extending down to mass splittings of 550 MeV at the LEP slepton limits (73 GeV). See their Fig. 16(a). If only selectron are considered, and $\widetilde{e} = \widetilde{e}_L$, masses below 169 GeV are excluded for mass splitting $\widetilde{e}_L$, $\widetilde{\chi}^0_1$ of 7.1 GeV. See their Fig. 16(b).

[15] AAD 14G searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for electroweak production of slepton pairs, decaying to a final sate with two leptons (e and μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of slepton pair production, see Fig. 8. An interpretation in the pMSSM is also given, see Fig. 10.

[16] KHACHATRYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for electroweak production of slepton pairs decaying to a final state with opposite-sign lepton pairs (e or μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models, see Fig. 18.

R-partiy violating $\widetilde{e}$ (Selectron) mass limit

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1065	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}^0_1}$ = 600 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
> 780	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{i33} \neq 0$, $m_{\widetilde{\chi}^0_1}$ = 300 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
> 410	95	[2] AAD	14X	ATLS	RPV, $\geq 4\ell^\pm$, $\widetilde{\ell} \to l\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \to \ell^\pm\ell^\mp\nu$

• • • We do not use the following data for averages, fits, limits, etc. • • •

> 89	95	[3] ABBIENDI	04F	OPAL	RPV, $\widetilde{e}_L$
> 92	95	[4] ABDALLAH	04M	DLPH	RPV, $\widetilde{e}_R$, indirect, Δm >5 GeV

[1] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[2] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass in an R-parity violating simplified model where the decay $\widetilde{\ell} \to \ell\widetilde{\chi}^0_1$, with $\widetilde{\chi}^0_1 \to \ell^\pm\ell^\mp\nu$, takes place with a branching ratio of 100%, see Fig. 9.

[3] ABBIENDI 04F use data from $\sqrt{s}$ = 189–209 GeV. They derive limits on sparticle masses under the assumption of RPV with $LL\overline{E}$ or $LQ\overline{D}$ couplings. The results are valid for

$\tan\beta = 1.5$, $\mu = -200$ GeV, with, in addition, $\Delta m > 5$ GeV for indirect decays via $LQ\overline{D}$. The limit quoted applies to direct decays via $LL\overline{E}$ or $LQ\overline{D}$ couplings. For indirect decays, the limits on the $\widetilde{e}_R$ mass are respectively 99 and 92 GeV for $LL\overline{E}$ and $LQ\overline{D}$ couplings and $m_{\widetilde{\chi}^0} = 10$ GeV and degrade slightly for larger $\widetilde{\chi}_1^0$ mass. Supersedes the results of ABBIENDI 00.

[4] ABDALLAH 04M use data from $\sqrt{s} = 192$–208 GeV to derive limits on sparticle masses under the assumption of RPV with $LL\overline{E}$ or $\overline{UDD}$ couplings. The results are valid for $\mu = -200$ GeV, $\tan\beta = 1.5$, $\Delta m > 5$ GeV and assuming a BR of 1 for the given decay. The limit quoted is for indirect $\overline{UDD}$ decays using the neutralino constraint of 39.5 GeV for $LL\overline{E}$ and of 38.0 GeV for $\overline{UDD}$ couplings, also derived in ABDALLAH 04M. For indirect decays via $LL\overline{E}$ the limit improves to 95 GeV if the constraint from the neutralino is used and to 94 GeV if it is not used. For indirect decays via $\overline{UDD}$ couplings it remains unchanged when the neutralino constraint is not used. Supersedes the result of ABREU 00U.

R-parity conserving $\widetilde{\mu}$ (Smuon) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>150	95	[1] AAD	20I	ATLS	2ℓ (soft), jets, $\not\!\!E_T$, $\widetilde{\mu}_R$ only, $m_{\widetilde{\mu}_R} - m_{\widetilde{\chi}_1^0} = 8.2$ GeV
>216	95	[2] AAD	20I	ATLS	2ℓ (soft), jets, $\not\!\!E_T$, $\widetilde{\mu}_L$ only, $m_{\widetilde{\mu}_L} - m_{\widetilde{\chi}_1^0} = 10$ GeV
>700	95	[3] AAD	20O	ATLS	$2\ell+\not\!\!E_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}_1^0}=0$ GeV
>210	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $\widetilde{\mu}_R$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>280	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $\widetilde{\mu}_L$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>290	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $\widetilde{\ell}_R$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>400	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $\widetilde{\ell}_L$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>450	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>310	95	[4] SIRUNYAN	19AW	CMS	$\ell^\pm\ell^\mp + \not\!\!E_T$, $m_{\widetilde{\mu}_R} = m_{\widetilde{\mu}_L}$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>190	95	[5] AABOUD	18R	ATLS	2ℓ (soft) + $\not\!\!E_T$, $m_{\widetilde{e}} = m_{\widetilde{\mu}}$, $m_{\widetilde{\mu}} - m_{\widetilde{\chi}_1^0} = 5$ GeV
		[6] CHATRCHYAN	14R	CMS	$\geq 3\ell^\pm$, $\widetilde{\ell} \to \ell^\pm\tau^\mp\tau^\mp\widetilde{G}$ simplified model, GMSB, stau (N)NLSP scenario
		[7] AAD	13B	ATLS	$2\ell^\pm + \not\!\!E_T$, SMS, pMSSM
> 91.0		[8] ABBIENDI	04	OPAL	$\Delta m > 3$ GeV, $\widetilde{\mu}_R^+\widetilde{\mu}_R^-$, $\lvert\mu\rvert > 100$ GeV, $\tan\beta=1.5$
> 86.7		[9] ACHARD	04	L3	$\Delta m > 10$ GeV, $\widetilde{\mu}_R^+\widetilde{\mu}_R^-$, $\lvert\mu\rvert > 200$ GeV, $\tan\beta \geq 2$
none 30–88	95	[10] ABDALLAH	03M	DLPH	$\Delta m > 5$ GeV, $\widetilde{\mu}_R^+\widetilde{\mu}_R^-$
> 94	95	[11] ABDALLAH	03M	DLPH	$\widetilde{\mu}_R$, $1 \leq \tan\beta \leq 40$, $\Delta m > 10$ GeV

$>$ 88	95	[12] HEISTER	02E	ALEP	$\Delta m >$ 15 GeV, $\widetilde{\mu}^+_R \widetilde{\mu}^-_R$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$>$500	95	[13] AABOUD	18BT	ATLS	$2\ell + \not{E}_T$, $m_{\widetilde{\ell}_R} = m_{\widetilde{\ell}_L}$ and $\widetilde{\ell}=\widetilde{e}$, $\widetilde{\mu}$, $\widetilde{\tau}$, with $m_{\widetilde{\chi}^0_1} = 0$ GeV
none 90–325	95	[14] AAD	14G	ATLS	$\widetilde{\ell}\widetilde{\ell} \rightarrow \ell^+ \widetilde{\chi}^0_1 \ell^- \widetilde{\chi}^0_1$, simplified model, $m_{\widetilde{\ell}_L} = m_{\widetilde{\ell}_R}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
		[15] KHACHATRY...	14I	CMS	$\widetilde{\ell} \rightarrow \ell \widetilde{\chi}^0_1$, simplified model
$>$ 80	95	[16] ABREU	00V	DLPH	$\widetilde{\mu}_R \widetilde{\mu}_R$ ($\widetilde{\mu}_R \rightarrow \mu \widetilde{G}$), $m_{\widetilde{G}} >$8 eV

[1] AAD 20I reported on ATLAS searches for slepton pair production in models with compressed mass spectra. A dataset of pp collisions at $\sqrt{s} = 13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 251 GeV for a mass splitting slepton$-\widetilde{\chi}^0_1$ of 10 GeV, with constraints extending down to mass splittings of 550 MeV at the LEP slepton limits (73 GeV). See their Fig. 16(a). If only smuon are considered, and $\widetilde{\mu} = \widetilde{\mu}_R$, masses below 150 GeV are excluded for mass splitting $\widetilde{\mu}_R$, $\widetilde{\chi}^0_1$ of 8.2 GeV. See their Fig. 16(b).

[2] AAD 20I reported on ATLAS searches for slepton pair production in models with compressed mass spectra. A dataset of pp collisions at $\sqrt{s} = 13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Events with $\not{E}_T$, two same-flavour, opposite-charge, low-transverse-momentum leptons, and jets from initial-state radiation or characteristic of vector-boson fusion production are selected. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 251 GeV for a mass splitting slepton$-\widetilde{\chi}^0_1$ of 10 GeV, with constraints extending down to mass splittings of 550 MeV at the LEP slepton limits (73 GeV). See their Fig. 16(a). If only smuon are considered, and $\widetilde{\mu} = \widetilde{\mu}_L$, masses below 216 GeV are excluded for mass splitting $\widetilde{\mu}_L$, $\widetilde{\chi}^0_1$ of 10 GeV. See their Fig. 16(b).

[3] AAD 20O reported on a search for electroweak production in models with charginos and sleptons decaying into final states with exactly two oppositely charged leptons and missing transverse momentum. A dataset of pp collisions at $\sqrt{s} = 13$ TeV corresponding to an integrated luminosity of 139 fb^{-1} was used. Light-flavour sleptons $\widetilde{e}$ and $\widetilde{\mu}$ are constrained at 95% C.L. to have masses above 700 GeV for massless lightest neutralino, see their Fig. 7(c). Exclusion limits are also set for selectrons and smuons separately, considering either right- or left-handed components, by including only the di-electron and di-muon same-flavour signal regions defined in the search, see their Fig. 8.

[4] SIRUNYAN 19AW searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak pair production of selectrons or smuons in events with two leptons (electrons or muons) of the opposite electric charge and same flavour, no jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the selectron mass assuming left-handed, right-handed or both left- and right-handed (mass degenerate) production, see their Figure 6. Similarly, limits are set on the smuon mass, see their Figure 7. Limits are also set on slepton masses under the assumption that the selectron and smuon are mass degenerate, see their Figure 5.

[5] AABOUD 18R searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for electroweak production in scenarios with compressed mass spectra in final states with two low-momentum leptons and missing transverse momentum. The data are found to be consistent with the SM prediction. Results are interpreted in slepton pair production models with a fourfold degeneracy assumed in selectron and smuon masses. The $\widetilde{\mu}$ masses are excluded up to

190 GeV for $m_{\widetilde{\mu}} - m_{\widetilde{\chi}_1^0} = 5$ GeV. The exclusion limits extend down to mass splittings of 1 GeV, see their Fig. 11.

[6] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass in a stau (N)NLSP simplified model (GMSB) where the decay $\widetilde{\ell} \to \ell^{\pm} \tau^{\pm} \tau^{\mp} \widetilde{G}$ takes place with a branching ratio of 100%, see Fig. 8.

[7] AAD 13B searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for sleptons decaying to a final state with two leptons (e and μ) and missing transverse energy. No excess beyond the Standard Model expectation is observed. Limits are derived in a simplified model of direct left-handed slepton pair production, where left-handed slepton masses between 85 and 195 GeV are excluded at 95% C.L. for $m_{\widetilde{\chi}_1^0} = 20$ GeV. See also Fig. 2(a). Exclusion limits are also derived in the phenomenological MSSM, see Fig. 3.

[8] ABBIENDI 04 search for $\widetilde{\mu}_R \widetilde{\mu}_R$ production in acoplanar di-muon final states in the 183–208 GeV data. See Fig. 14 for the dependence of the limits on $m_{\widetilde{\chi}_1^0}$ and for the limit at tanβ=35. Under the assumption of 100% branching ratio for $\widetilde{\mu}_R \to \mu \widetilde{\chi}_1^0$, the limit improves to 94.0 GeV for $\Delta m > 4$ GeV. See Fig. 11 for the dependence of the limits on $m_{\widetilde{\chi}_1^0}$ at several values of the branching ratio. This limit supersedes ABBIENDI 00G.

[9] ACHARD 04 search for $\widetilde{\mu}_R \widetilde{\mu}_R$ production in acoplanar di-muon final states in the 192–209 GeV data. Limits on $m_{\widetilde{\mu}_R}$ are derived from a scan over the MSSM parameter space with universal GUT scale gaugino and scalar masses $m_{1/2}$ and m_0, $1 \leq$ tan$\beta \leq 60$ and $-2 \leq \mu \leq 2$ TeV. See Fig. 4 for the dependence of the limits on $m_{\widetilde{\chi}_1^0}$. This limit supersedes ACCIARRI 99W.

[10] ABDALLAH 03M looked for acoplanar dimuon $+\not{E}$ final states at $\sqrt{s} =$ 189–208 GeV. The limit assumes B($\widetilde{\mu} \to \mu \widetilde{\chi}_1^0$) = 100%. See Fig. 16 for limits on the ($m_{\widetilde{\mu}_R}$, $m_{\widetilde{\chi}_1^0}$) plane. These limits include and update the results of ABREU 01.

[11] ABDALLAH 03M uses data from $\sqrt{s} =$ 192–208 GeV to obtain limits in the framework of the MSSM with gaugino and sfermion mass universality at the GUT scale. An indirect limit on the mass is derived by constraining the MSSM parameter space by the results from direct searches for neutralinos (including cascade decays) and for sleptons. These limits are valid for values of $M_2 < 1$ TeV, $|\mu| \leq 1$ TeV with the $\widetilde{\chi}_1^0$ as LSP. The quoted limit is obtained when there is no mixing in the third family. See Fig. 43 for the mass limits as a function of tanβ. These limits update the results of ABREU 00W.

[12] HEISTER 02E looked for acoplanar dimuon $+ \not{E}_T$ final states from $e^+ e^-$ interactions between 183 and 209 GeV. The mass limit assumes B($\widetilde{\mu} \to \mu \widetilde{\chi}_1^0$)=1. See their Fig. 4 for the dependence of the limit on Δm. These limits include and update the results of BARATE 01.

[13] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass up to 500 GeV for massless $\widetilde{\chi}_1^0$, assuming degeneracy of $\widetilde{e}$, $\widetilde{\mu}$, and $\widetilde{\tau}$ and exploiting the 2ℓ signature, see their Figure 8(b).

[14] AAD 14G searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of slepton pairs, decaying to a final sate with two leptons (e and μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models of slepton pair production, see Fig. 8. An interpretation in the pMSSM is also given, see Fig. 10.

[15] KHACHATRYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for electroweak production of slepton pairs decaying to a final state with opposite-sign lepton

pairs (e or μ) and missing transverse momentum. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in simplified models, see Fig. 18.

[16] ABREU 00V use data from $\sqrt{s}$= 130–189 GeV to search for tracks with large impact parameter or visible decay vertices. Limits are obtained as function of $m_{\widetilde{G}}$, after combining these results with the search for slepton pair production in the SUGRA framework from ABREU 01 to cover prompt decays and on stable particle searches from ABREU 00Q. For limits at different $m_{\widetilde{G}}$, see their Fig. 12.

R-parity violating $\widetilde{\mu}$ (Smuon) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
> 780	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{i33} \neq 0$, $m_{\widetilde{\chi}_1^0}$=300 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
>1060	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}_1^0}$=600 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
> 410	95	[2] AAD	14X	ATLS	RPV, $\geq 4\ell^{\pm}$, $\widetilde{\ell} \rightarrow \ell\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \rightarrow \ell^{\pm}\ell^{\mp}\nu$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[3] SIRUNYAN	19AO		$\mu^{\pm}\mu^{\pm}$ + $\geq$ 2jets, $\lambda'_{211} \neq 0$, $\widetilde{\mu}_L \rightarrow \mu\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \rightarrow \mu q\overline{q}$
> 87	95	[4] ABDALLAH	04M	DLPH	RPV, $\widetilde{\mu}_R$, indirect, Δm >5 GeV
> 81	95	[5] HEISTER	03G	ALEP	RPV, $\widetilde{\mu}_L$

[1] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[2] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass in an R-parity violating simplified model where the decay $\widetilde{\ell} \rightarrow \ell\widetilde{\chi}_1^0$, with $\widetilde{\chi}_1^0 \rightarrow \ell^{\pm}\ell^{\mp}\nu$, takes place with a branching ratio of 100%, see Fig. 9.

[3] SIRUNYAN 19AO searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two same-sign muons and at last two jets, originating from resonant production of second-generation sleptons ($\widetilde{\mu}_L$, $\widetilde{\nu}_{\mu}$) via the R-parity violating coupling λ'_{211} to quarks. No significant excess above the Standard Model expectations is observed. Upper limits on cross sections are derived in the context of two simplified models, see their Figure 4. The cross section limits are translated into limits on λ'_{211} for a modified CMSSM, see their Figure 5.

[4] ABDALLAH 04M use data from $\sqrt{s}$ = 192–208 GeV to derive limits on sparticle masses under the assumption of RPV with $LL\overline{E}$ or $\overline{U}\overline{D}\overline{D}$ couplings. The results are valid for μ = −200 GeV, tanβ = 1.5, Δm > 5 GeV and assuming a BR of 1 for the given decay. The limit quoted is for indirect $\overline{U}\overline{D}\overline{D}$ decays using the neutralino constraint of 39.5 GeV for $LL\overline{E}$ and of 38.0 GeV for $\overline{U}\overline{D}\overline{D}$ couplings, also derived in ABDALLAH 04M. For indirect decays via $LL\overline{E}$ the limit improves to 90 GeV if the constraint from the neutralino is used and remains at 87 GeV if it is not used. For indirect decays via $\overline{U}\overline{D}\overline{D}$

couplings it degrades to 85 GeV when the neutralino constraint is not used. Supersedes the result of ABREU 00U.

[5] HEISTER 03G searches for the production of smuons in the case of RPV prompt decays with $LL\overline{E}$, $LQ\overline{D}$ or $\overline{UDD}$ couplings at $\sqrt{s}$ = 189–209 GeV. The search is performed for direct and indirect decays, assuming one coupling at a time to be non-zero. The limit holds for direct decays mediated by RPV $LQ\overline{D}$ couplings and improves to 90 GeV for indirect decays (for Δm > 10 GeV). Limits are also given for $LL\overline{E}$ direct ($m_{\widetilde{\mu}R}$ > 87 GeV) and indirect decays ($m_{\widetilde{\mu}R}$ > 96 GeV for $m(\widetilde{\chi}^0_1)$ > 23 GeV from BARATE 98S) and for $\overline{UDD}$ indirect decays ($m_{\widetilde{\mu}R}$ > 85 GeV for Δm > 10 GeV). Supersedes the results from BARATE 01B.

R-parity conserving $\widetilde{\tau}$ (Stau) mass limit

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
none 120–390	95	[1] AAD	20H		2 hadronic τ + $\not{E}_T$, $\widetilde{\tau}_{R/L} \to \tau\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
none 90–150	95	[2] SIRUNYAN	20P	CMS	2 τ+$\not{E}_T$, $\tau_h\tau_h$ and $\ell\tau_h$, $m_{\widetilde{\tau}_R}$=$m_{\widetilde{\tau}_L}$, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
> 85.2		[3] ABBIENDI	04	OPAL	Δm > 6 GeV, θ_τ=π/2, $\lvert\mu\rvert$ > 100 GeV, tanβ=1.5
> 78.3		[4] ACHARD	04	L3	Δm > 15 GeV, θ_τ=π/2, $\lvert\mu\rvert$ >200 GeV,tan$\beta \geq$ 2
> 81.9	95	[5] ABDALLAH	03M	DLPH	Δm >15 GeV, all θ_τ
> 79	95	[6] HEISTER	02E	ALEP	Δm > 15 GeV, θ_τ=π/2
> 76	95	[6] HEISTER	02E	ALEP	Δm > 15 GeV, θ_τ=0.91
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>500	95	[7] AABOUD	18BT	ATLS	2ℓ+$\not{E}_T$, $m_{\widetilde{\ell}_R}$=$m_{\widetilde{\ell}_L}$, $\widetilde{\ell}$=$\widetilde{e}$, $\widetilde{\mu}$, $\widetilde{\tau}$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
	95	[8] KHACHATRY...	17L	CMS	2 τ+$\not{E}_T$, $\widetilde{\tau}_L \to \tau\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
none 109	95	[9] AAD	16AA	ATLS	2 hadronic τ + $\not{E}_T$, $\widetilde{\tau}_{R/L} \to \tau\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
		[10] AAD	12AF	ATLS	2τ + jets + $\not{E}_T$, GMSB
		[11] AAD	12AG	ATLS	$\geq$ 1τ_h + jets + $\not{E}_T$, GMSB
		[12] AAD	12CM	ATLS	$\geq$ 1τ + jets + $\not{E}_T$, GMSB
> 87.4	95	[13] ABBIENDI	06B	OPAL	$\widetilde{\tau}_R \to \tau\widetilde{G}$, all $\tau(\widetilde{\tau}_R)$
> 68	95	[14] ABDALLAH	04H	DLPH	AMSB, μ > 0
none m_τ− 26.3	95	[5] ABDALLAH	03M	DLPH	Δm >m_τ, all θ_τ

[1] AAD 20H presented ATLAS searches for direct production for $\widetilde{\tau}$ in final states with two hadronically decaying leptons and $\not{E}_T$. The analysis uses a dataset of pp collisions at $\sqrt{s}$ = 13 TeV corresponding to an integrated luminosity of 139 fb^{-1}. Exclusion limits at 95% C.L. are derived in scenarios of direct production of $\widetilde{\tau}$ pairs with each $\widetilde{\tau}$ decaying into a τ and the lightest neutralino $\widetilde{\chi}^0_1$ in simplified models where the $\widetilde{\tau}_R$ and $\widetilde{\tau}_L$ mass eigenstates are degenerate. Stau masses from 120GeV to 390GeV are excluded for a massless lightest neutralino, see their Fig. 7(a). If $\widetilde{\tau}_L$-only pair production is considered, the exclusion region extends between 155 GeV to 310 GeV, see their Fig. 7(b).

[2] SIRUNYAN 20P searched in 77.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct pair production of tau sleptons in events with a tau lepton pair and significant missing transverse momentum. Final states with two double hadronic decay of the tau leptons are considered, as well as where one of the tau leptons decays into an electron or a muon. No significant excess above the Standard Model expectations is observed. Limits are set on the stau mass in a simplified models where two tau sleptons are pair produced and decay to a tau lepton and the lightest neutralino, assuming either only left-handed stau production, see Figure 8, or assuming degenerate left- and right-handed stau production, see Figure 9.

[3] ABBIENDI 04 search for $\widetilde{\tau}\widetilde{\tau}$ production in acoplanar di-tau final states in the 183–208 GeV data. See Fig. 15 for the dependence of the limits on $m_{\widetilde{\chi}^0_1}$ and for the limit at tanβ=35. Under the assumption of 100% branching ratio for $\widetilde{\tau}_R \rightarrow \tau \widetilde{\chi}^0_1$, the limit improves to 89.8 GeV for $\Delta m > 8$ GeV. See Fig. 12 for the dependence of the limits on $m_{\widetilde{\chi}^0_1}$ at several values of the branching ratio and for their dependence on θ_τ. This limit supersedes ABBIENDI 00G.

[4] ACHARD 04 search for $\widetilde{\tau}\widetilde{\tau}$ production in acoplanar di-tau final states in the 192–209 GeV data. Limits on $m_{\widetilde{\tau}_R}$ are derived from a scan over the MSSM parameter space with universal GUT scale gaugino and scalar masses $m_{1/2}$ and m_0, $1 \leq \tan\beta \leq 60$ and $-2 \leq \mu \leq 2$ TeV. See Fig. 4 for the dependence of the limits on $m_{\widetilde{\chi}^0_1}$.

[5] ABDALLAH 03M looked for acoplanar ditaus $+\not\!\!E$ final states at $\sqrt{s}$ = 130–208 GeV. A dedicated search was made for low mass $\widetilde{\tau}$s decoupling from the Z^0. The limit assumes B($\widetilde{\tau} \rightarrow \tau\widetilde{\chi}^0_1$) = 100%. See Fig. 20 for limits on the ($m_{\widetilde{\tau}}$,$m_{\widetilde{\chi}^0_1}$) plane and as function of the $\widetilde{\chi}^0_1$ mass and of the branching ratio. The limit in the low-mass region improves to 29.6 and 31.1 GeV for $\widetilde{\tau}_R$ and $\widetilde{\tau}_L$, respectively, at $\Delta m > m_\tau$. The limit in the high-mass region improves to 84.7 GeV for $\widetilde{\tau}_R$ and $\Delta m > 15$ GeV. These limits include and update the results of ABREU 01.

[6] HEISTER 02E looked for acoplanar ditau + $\not\!\!E_T$ final states from e^+e^- interactions between 183 and 209 GeV. The mass limit assumes B($\widetilde{\tau} \rightarrow \tau\widetilde{\chi}^0_1$)=1. See their Fig. 4 for the dependence of the limit on Δm. These limits include and update the results of BARATE 01.

[7] AABOUD 18BT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos, chargino and next-to-lightest neutralinos and sleptons in events with two or three leptons (electrons or muons), with or without jets, and large missing transverse energy. No significant excess above the Standard Model expectations is observed. Limits are set on the slepton mass up to 500 GeV for massless $\widetilde{\chi}^0_1$, assuming degeneracy of $\widetilde{e}$, $\widetilde{\mu}$, and $\widetilde{\tau}$ and exploiting the 2ℓ signature, see their Figure 8(b).

[8] KHACHATRYAN 17L searched in about 19 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two τ (at least one decaying hadronically) and $\not\!\!E_T$. Results were interpreted to set constraints on the cross section for production of $\widetilde{\tau}_L$ pairs for $m_{\widetilde{\chi}^0_1}$=1 GeV. No mass constraints are set, see their Fig. 7.

[9] AAD 16AA summarized and extended ATLAS searches for electroweak supersymmetry in final states containing several charged leptons, $\not\!\!E_T$, with or without hadronic jets, in 20 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. The paper reports 95% C.L. exclusion limits on the cross-section for production of $\widetilde{\tau}_R$ and $\widetilde{\tau}_L$ pairs for various $m_{\widetilde{\chi}^0_1}$, using the 2 hadronic $\tau + \not\!\!E_T$ analysis. The $m_{\widetilde{\tau}_{R/L}}$ = 109 GeV is excluded for $m_{\widetilde{\chi}^0_1}$ = 0 GeV, with the constraints being stronger for $\widetilde{\tau}_R$. See their Fig. 12.

[10] AAD 12AF searched in 2 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two tau leptons, jets and large $\not\!\!E_T$ in a GMSB framework. No significant excess above the expected background was found and an upper limit on the visible cross section for new phenomena is set. A 95% C.L. lower limit of 32 TeV on the mGMSB breaking scale Λ is set for M_{mess} = 250 TeV, N_S = 3, $\mu > 0$ and C_{grav} = 1, independent of tanβ.

[11] AAD 12AG searched in 2.05 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least one hadronically decaying tau lepton, jets, and large $\not{E}_T$ in a GMSB framework. No significant excess above the expected background was found and an upper limit on the visible cross section for new phenomena is set. A 95% C.L. lower limit of 30 TeV on the mGMSB breaking scale Λ is set for M_{mess} = 250 TeV, N_S = 3, μ > 0 and C_{grav} = 1, independent of tanβ. For large values of tanβ, the limit on Λ increases to 43 TeV.

[12] AAD 12CM searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$=7 TeV for events with at least one tau lepton, zero or one additional light lepton (e/μ) jets, and large $\not{E}_T$ in a GMSB framework. No significant excess above the expected background was found and an upper limit on the visible cross section for new phenomena is set. A 95% C. L. lower limit of 54 TeV on the mGMSB breaking scale Λ is set for M_{mess} = 250 TeV, N_S = 3, μ > 0 and C_{grav} = 1, for tanβ > 20. Here the $\widetilde{\tau}_1$ is the NLSP.

[13] ABBIENDI 06B use 600 pb^{-1} of data from $\sqrt{s}$ = 189–209 GeV. They look for events from pair-produced staus in a GMSB scenario with $\widetilde{\tau}$ NLSP including prompt $\widetilde{\tau}$ decays to ditaus + $\not{E}$ final states, large impact parameters, kinked tracks and heavy stable charged particles. Limits on the cross-section are computed as a function of m($\widetilde{\tau}$) and the lifetime, see their Fig. 7. The limit is compared to the $\sigma \cdot BR^2$ from a scan over the GMSB parameter space.

[14] ABDALLAH 04H use data from LEP 1 and $\sqrt{s}$ = 192–208 GeV. They re-use results or re-analyze the data from ABDALLAH 03M to put limits on the parameter space of anomaly-mediated supersymmetry breaking (AMSB), which is scanned in the region 1< $m_{3/2}$ <50 TeV, 0< m_0 <1000 GeV, 1.5<tanβ <35, both signs of μ. The constraints are obtained from the searches for mass degenerate chargino and neutralino, for SM-like and invisible Higgs, for leptonically decaying charginos and from the limit on non-SM Z width of 3.2 MeV. The limit is for m_t = 174.3 GeV (see Table 2 for other m_t values). The limit improves to 75 GeV for μ < 0.

R-parity violating $\widetilde{\tau}$ (Stau) mass limit

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1060	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, RPV, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}_1^0}$ = 600 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
> 780	95	[1] AABOUD	18Z	ATLS	$\geq 4\ell$, RPV, $\lambda_{i33} \neq 0$, $m_{\widetilde{\chi}_1^0}$ = 300 GeV (mass-degenerate left-handed sleptons and sneutrinos of all 3 generations)
• • • We do not use the following data for averages, fits, limits, etc. • • •					
> 74	95	[2] ABBIENDI	04F	OPAL	RPV, $\widetilde{\tau}_L$
> 90	95	[3] ABDALLAH	04M	DLPH	RPV, $\widetilde{\tau}_R$, indirect, Δm >5 GeV

[1] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[2] ABBIENDI 04F use data from $\sqrt{s}$ = 189–209 GeV. They derive limits on sparticle masses under the assumption of RPV with $LL\overline{E}$ or $LQ\overline{D}$ couplings. The results are valid for tanβ = 1.5, μ = −200 GeV, with, in addition, Δm > 5 GeV for indirect decays via $LQ\overline{D}$. The limit quoted applies to direct decays with $LL\overline{E}$ couplings and improves to 75 GeV for $LQ\overline{D}$ couplings. The limit on the $\widetilde{\tau}_R$ mass for indirect decays is 92 GeV for $LL\overline{E}$ couplings at $m_{\widetilde{\chi}^0}$ = 10 GeV and no exclusion is obtained for $LQ\overline{D}$ couplings. Supersedes the results of ABBIENDI 00.

[3] ABDALLAH 04M use data from $\sqrt{s}$ = 192–208 GeV to derive limits on sparticle masses under the assumption of RPV with $LL\overline{E}$ couplings. The results are valid for μ = −200 GeV, tanβ = 1.5, Δm > 5 GeV and assuming a BR of 1 for the given decay. The limit quoted is for indirect decays using the neutralino constraint of 39.5 GeV, also derived in ABDALLAH 04M. For indirect decays via $LL\overline{E}$ the limit decreases to 86 GeV if the constraint from the neutralino is not used. Supersedes the result of ABREU 00U.

Long-lived $\widetilde{\ell}$ (Slepton) mass limit

Limits on scalar leptons which leave detector before decaying. Limits from Z decays are independent of lepton flavor. Limits from continuum e^+e^- annihilation are also independent of flavor for smuons and staus. Selectron limits from e^+e^- collisions in the continuum depend on MSSM parameters because of the additional neutralino exchange contribution.

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>430	95	[1] AABOUD	19AT	ATLS	long-lived $\widetilde{\tau}$, GMSB
>490	95	[2] KHACHATRY...	16BW	CMS	long-lived $\widetilde{\tau}$ from inclusive production, mGMSB SPS line 7 scenario
>240	95	[2] KHACHATRY...	16BW	CMS	long-lived $\widetilde{\tau}$ from direct pair production, mGMSB SPS line 7 scenario
>440	95	[3] AAD	15AE	ATLS	mGMSB, M_{mess} = 250 TeV, N_5 = 3, μ > 0, C_{grav} = 5000, tanβ = 10
>385	95	[3] AAD	15AE	ATLS	mGMSB, M_{mess} = 250 TeV, N_5 = 3, μ > 0, C_{grav} = 5000, tanβ = 50
>286	95	[3] AAD	15AE	ATLS	direct $\widetilde{\tau}$ production
none 124–309	95	[4] AAIJ	15BD	LHCB	long-lived $\widetilde{\tau}$, mGMSB, SPS7
> 98	95	[5] ABBIENDI	03L	OPAL	$\widetilde{\mu}_R$, $\widetilde{\tau}_R$
none 2–87.5	95	[6] ABREU	00Q	DLPH	$\widetilde{\mu}_R$, $\widetilde{\tau}_R$
> 81.2	95	[7] ACCIARRI	99H	L3	$\widetilde{\mu}_R$, $\widetilde{\tau}_R$
> 81	95	[8] BARATE	98K	ALEP	$\widetilde{\mu}_R$, $\widetilde{\tau}_R$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
>300	95	[9] AAD	13AA	ATLS	long-lived $\widetilde{\tau}$, GMSB, tanβ = 5–20
		[10] ABAZOV	13B	D0	long-lived $\widetilde{\tau}$, 100 < $m_{\widetilde{\tau}}$ <300 GeV
>339	95	[11,12] CHATRCHYAN	13AB	CMS	long-lived $\widetilde{\tau}$, direct $\widetilde{\tau}_1$ pair prod., minimal GMSB, SPS line 7
>500	95	[11,13] CHATRCHYAN	13AB	CMS	long-lived $\widetilde{\tau}$, $\widetilde{\tau}_1$ from direct pair prod. and from decay of heavier SUSY particles, minimal GMSB, SPS line 7
>314	95	[14] CHATRCHYAN	12L	CMS	long-lived $\widetilde{\tau}$, $\widetilde{\tau}_1$ from decay of heavier SUSY particles, minimal GMSB, SPS line 7
>136	95	[15] AAD	11P	ATLS	stable $\widetilde{\tau}$, GMSB scenario, tanβ=5

[1] AABOUD 19AT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for metastable and stable R-hadrons. Multiple search strategies for a wide range of lifetimes, corresponding to path lengths of a few meters, are defined. No significant deviations from the expected Standard Model background are observed. Results are interpreted in terms of exclusion limits on long-lived stau in the context of GMSB models. Lower limits on the mass for direct production of staus are set at 430 GeV, see their Fig. 10 (left).

[2] KHACHATRYAN 16BW searched in 2.5 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with heavy stable charged particles, identified by their anomalously high energy deposits in the silicon tracker and/or long time-of-flight measurements by the muon system. No evidence for an excess over the expected background is observed. Limits are derived for pair production of tau sleptons as a function of mass, depending on their direct or inclusive production in a minimal GMSB scenario along the Snowmass Points and Slopes (SPS) line 7, see Fig. 4 and Table 7.

[3] AAD 15AE searched in 19.1 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for heavy long-lived charged particles, measured through their specific ionization energy loss in the ATLAS pixel detector or their time-of-flight in the ALTAS muon system. In the absence of an excess of events above the expected backgrounds, limits are set on stable $\widetilde{\tau}$ sleptons in various scenarios, see Figs. 5-7.

[4] AAIJ 15BD searched in 3.0 fb^{-1} of pp collisions at $\sqrt{s} = 7$ and 8 TeV for evidence of Drell-Yan pair production of long-lived $\widetilde{\tau}$ particles. No evidence for such particles is observed and 95% C.L. upper limits on the cross section of $\widetilde{\tau}$ pair production are derived, see Fig. 7. In the mGMSB, assuming the SPS7 benchmark scenario $\widetilde{\tau}$ masses between 124 and 309 GeV are excluded at 95% C.L.

[5] ABBIENDI 03L used $e^+ e^-$ data at $\sqrt{s} = 130$–209 GeV to select events with two high momentum tracks with anomalous dE/dx. The excluded cross section is compared to the theoretical expectation as a function of the heavy particle mass in their Fig. 3. The limit improves to 98.5 GeV for $\widetilde{\mu}_L$ and $\widetilde{\tau}_L$. The bounds are valid for colorless spin 0 particles with lifetimes longer than 10^{-6} s. Supersedes the results from ACKERSTAFF 98P.

[6] ABREU 00Q searches for the production of pairs of heavy, charged stable particles in $e^+ e^-$ annihilation at $\sqrt{s}$= 130–189 GeV. The upper bound improves to 88 GeV for $\widetilde{\mu}_L$, $\widetilde{\tau}_L$. These limits include and update the results of ABREU 98P.

[7] ACCIARRI 99H searched for production of pairs of back-to-back heavy charged particles at $\sqrt{s}$=130–183 GeV. The upper bound improves to 82.2 GeV for $\widetilde{\mu}_L$, $\widetilde{\tau}_L$.

[8] The BARATE 98K mass limit improves to 82 GeV for $\widetilde{\mu}_L$,$\widetilde{\tau}_L$. Data collected at $\sqrt{s}$=161–184 GeV.

[9] AAD 13AA searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events containing long-lived massive particles in a GMSB framework. No significant excess above the expected background was found. A 95% C.L. lower limit of 300 GeV is placed on long-lived $\widetilde{\tau}$'s in the GMSB model with $M_{mess} = 250$ TeV, $N_S = 3$, $\mu > 0$, for tanβ = 5–20. The lower limit on the GMSB breaking scale Λ was found to be 99–110 TeV, for tanβ values between 5 and 40, see Fig. 4 (top). Also, directly produced long-lived sleptons, or sleptons decaying to long-lived ones, are excluded at 95% C.L. up to a $\widetilde{\tau}$ mass of 278 GeV for models with slepton splittings smaller than 50 GeV.

[10] ABAZOV 13B looked in 6.3 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for charged massive long-lived particles in events with muon-like particles that have both speed and ionization energy loss inconsistent with muons produced in beam collisions. In the absence of an excess, limits are set at 95% C.L. on the production cross section of stau leptons in the mass range 100–300 GeV, see their Table 20 and Fig. 23.

[11] CHATRCHYAN 13AB looked in 5.0 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV and in 18.8 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{\tau}_1$'s. No evidence for an excess over the expected background is observed. Supersedes CHATRCHYAN 12L.

[12] CHATRCHYAN 13AB limits are derived for pair production of $\widetilde{\tau}_1$ as a function of mass in minimal GMSB scenarios along the Snowmass Points and Slopes (SPS) line 7 (see Fig. 8 and Table 7). The limit given here is valid for direct pair $\widetilde{\tau}_1$ production.

[13] CHATRCHYAN 13AB limits are derived for the production of $\widetilde{\tau}_1$ as a function of mass in minimal GMSB scenarios along the Snowmass Points and Slopes (SPS) line 7 (see Fig. 8 and Table 7). The limit given here is valid for the production of $\widetilde{\tau}_1$ from both direct pair production and from the decay of heavier supersymmetric particles.

[14] CHATRCHYAN 12L looked in 5.0 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{\tau}_1$'s. No evidence for an excess over the expected background is observed. Limits are derived for the production of $\widetilde{\tau}_1$ as a function of mass in minimal GMSB scenarios along the Snowmass Points and Slopes (SPS) line 7 (see Fig. 3). The limit given here is valid for the production of $\widetilde{\tau}_1$ in the decay of heavier supersymmetric particles.

[15] AAD 11P looked in 37 pb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events with two heavy stable particles, reconstructed in the Inner tracker and the Muon System and identified by their time of flight in the Muon System. No evidence for an excess over the SM expectation is observed. Limits on the mass are derived, see Fig. 3, for $\widetilde{\tau}$ in a GMSB scenario and for sleptons produced by electroweak processes only, in which case the limit degrades to 110 GeV.

$\widetilde{q}$ (Squark) mass limit

For $m_{\widetilde{q}} > 60$–70 GeV, it is expected that squarks would undergo a cascade decay via a number of neutralinos and/or charginos rather than undergo a direct decay to photinos as assumed by some papers. Limits obtained when direct decay is assumed are usually higher than limits when cascade decays are included.

Limits from $e^+ e^-$ collisions depend on the mixing angle of the lightest mass eigenstate $\widetilde{q}_1 = \widetilde{q}_R \sin\theta_q + \widetilde{q}_L \cos\theta_q$. It is usually assumed that only the sbottom and stop squarks have non-trivial mixing angles (see the stop and sbottom sections). Here, unless otherwise noted, squarks are always taken to be either left/right degenerate, or purely of left or right type. Data from Z decays have set squark mass limits above 40 GeV, in the case of $\widetilde{q} \to q \widetilde{\chi}_1$ decays if $\Delta m = m_{\widetilde{q}} - m_{\widetilde{\chi}_1^0} \gtrsim 5$ GeV. For smaller values of Δm, current constraints on the invisible width of the Z ($\Delta\Gamma_{\text{inv}} < 2.0$ MeV, LEP 00) exclude $m_{\widetilde{u}_{L,R}} < 44$ GeV, $m_{\widetilde{d}_R} < 33$ GeV, $m_{\widetilde{d}_L} < 44$ GeV and, assuming all squarks degenerate, $m_{\widetilde{q}} < 45$ GeV.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, et al. (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

R-parity conserving $\widetilde{q}$ (Squark) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1590	95	[1] SIRUNYAN	19AG	CMS	$2\gamma + \not{E}_T$, Tsqk4B, 500 GeV $< m_{\widetilde{\chi}_1^0} < 1500$ GeV
>1130	95	[2] SIRUNYAN	19CH	CMS	jets$+\not{E}_T$, Tsqk1, 1 light flavour, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1630	95	[2] SIRUNYAN	19CH	CMS	jets$+\not{E}_T$, Tsqk1, 8 degenerate light flavours, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1430	95	[3] SIRUNYAN	19K	CMS	$\gamma + \ell + \not{E}_T$, Tsqk4A, $m_{\widetilde{\chi}_1^0} =$ 1200 GeV

>1200	95	[4] AABOUD	18BJ	ATLS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not{E}_T$, Tsqk2, $m_{\tilde{\chi}_1^0}$ = 1 GeV, any $m_{\tilde{\chi}_2^0}$
> 850	95	[5] AABOUD	18BV	ATLS	c-jets+$\not{E}_T$, Tsqk1 (charm only), $m_{\tilde{\chi}_1^0}$ = 0 GeV
> 710	95	[6] AABOUD	18I	ATLS	$\geq$ 1 jets+$\not{E}_T$, Tsqk1, $m_{\tilde{q}} \sim m_{\tilde{\chi}_1^0}$
>1820	95	[7] AABOUD	18U	ATLS	2 γ + $\not{E}_T$, GGM, Tsqk4B, any NLSP mass
>1550	95	[8] AABOUD	18V	ATLS	jets+$\not{E}_T$, Tsqk1, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1150	95	[9] AABOUD	18V	ATLS	jets+$\not{E}_T$, Tsqk3, $m_{\tilde{\chi}_1^{\pm}}$ = 0.5 ($m_{\tilde{q}}$ + $m_{\tilde{\chi}_1^0}$), $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1650	95	[10] SIRUNYAN	18AA	CMS	$\geq 1\gamma$ + $\not{E}_T$, Tsqk4A
>1750	95	[10] SIRUNYAN	18AA	CMS	$\geq 1\gamma$ + $\not{E}_T$, Tsqk4B
> 675	95	[11] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$, Tsqk1, 1 light flavor state, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1320	95	[11] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$,Tsqk1,8 degenerate light flavor states, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1220	95	[12] AABOUD	17AR	ATLS	1ℓ+jets+$\not{E}_T$, Tsqk3, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1000	95	[13] AABOUD	17N	ATLS	2 same-flavour, opposite-sign ℓ + jets + $\not{E}_T$, Tsqk2, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1150	95	[14] KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tsqk1, 4(flavor) x 2(isospin) = 8 mass degenerate states, $m_{\tilde{\chi}_1^0}$ = 0 GeV
> 575	95	[14] KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tsqk1, one light flavor state, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1370	95	[15] KHACHATRY...	17V	CMS	2 γ + $\not{E}_T$, GGM, Tsqk4, any NLSP mass
>1600	95	[16] SIRUNYAN	17AY	CMS	γ + jets+$\not{E}_T$, Tsqk4B, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1370	95	[16] SIRUNYAN	17AY	CMS	γ + jets+$\not{E}_T$, Tsqk4A, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1050	95	[17] SIRUNYAN	17AZ	CMS	$\geq$ 1 jets+$\not{E}_T$, Tsqk1, single light flavor state, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1550	95	[17] SIRUNYAN	17AZ	CMS	$\geq$ 1 jets+$\not{E}_T$, Tsqk1, 4(flavor) x 2(isospin) = 8 degenerate mass states, $m_{\tilde{\chi}_1^0}$ = 0 GeV
>1390	95	[18] SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tsqk1, 4(flavor) x 2(isospin) = 8 degenerate mass states, $m_{\tilde{\chi}_1^0}$ = 0 GeV
> 950	95	[18] SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tsqk1, one light flavor state, $m_{\tilde{\chi}_1^0}$ = 0 GeV

$>$ 608	95	[19] AABOUD	16D	ATLS	$\geq$ 1 jet + $\not\!\!E_T$, Tsqk1, $m_{\widetilde{q}}-m_{\widetilde{\chi}_1^0}$ = 5 GeV
$>$1030	95	[20] AABOUD	16N	ATLS	$\geq$ 2 jets + $\not\!\!E_T$, Tsqk1, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 600	95	[21] KHACHATRY...	16BS	CMS	jets + $\not\!\!E_T$, Tsqk1, single light squark, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$1260	95	[21] KHACHATRY...	16BS	CMS	jets + $\not\!\!E_T$, Tsqk1, 8 degenerate light squarks, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 850	95	[22] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
$>$ 250	95	[23] AAD	15CS	ATLS	photon + $\not\!\!E_T$, $pp \rightarrow \widetilde{q}\widetilde{q}^*\gamma$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, $m_{\widetilde{q}} - m_{\widetilde{\chi}_1^0} = m_c$
$>$ 490	95	[24] AAD	15K	ATLS	$\widetilde{c} \rightarrow c\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ < 200 GeV
$>$ 875	95	[25] KHACHATRY...	15AF	CMS	$\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, simplified model, 8 degenerate light $\widetilde{q}$, $m_{\widetilde{\chi}_1^0}$ = 0
$>$ 520	95	[25] KHACHATRY...	15AF	CMS	$\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, simplified model, single light squark, $m_{\widetilde{\chi}_1^0}$ = 0
>1450	95	[25] KHACHATRY...	15AF	CMS	CMSSM, tanβ = 30, $A_0 = -2\max(m_0,\ m_{1/2})$, μ > 0
$>$ 850	95	[26] AAD	14AE	ATLS	jets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ simplified model, mass degenerate first and second generation squarks, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$ 440	95	[26] AAD	14AE	ATLS	jets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ simplified model, single light-flavour squark, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
$>$1700	95	[26] AAD	14AE	ATLS	jets + $\not\!\!E_T$, mSUGRA/CMSSM, $m_{\widetilde{q}} = m_{\widetilde{g}}$
$>$ 800	95	[27] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
$>$ 780	95	[28] CHATRCHYAN	14I	CMS	multijets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ < 200 GeV
$>$1360	95	[29] AAD	13L	ATLS	jets + $\not\!\!E_T$, CMSSM, $m_{\widetilde{g}} = m_{\widetilde{q}}$
$>$1200	95	[30] AAD	13Q	ATLS	γ+b+$\not\!\!E_T$,higgsino-like neutralino, $m_{\widetilde{\chi}_1^0}$ > 220 GeV, GMSB
		[31] CHATRCHYAN	13	CMS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not\!\!E_T$, CMSSM
$>$1250	95	[32] CHATRCHYAN	13G	CMS	0,1,2, $\geq$ 3 b-jets + $\not\!\!E_T$, CMSSM, $m_{\widetilde{q}} = m_{\widetilde{g}}$
$>$1430	95	[33] CHATRCHYAN	13H	CMS	2γ + $\geq$ 4 jets + low $\not\!\!E_T$, stealth SUSY model
$>$ 750	95	[34] CHATRCHYAN	13T	CMS	jets + $\not\!\!E_T$, $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$= 0 GeV
$>$ 820	95	[35] AAD	12AX	ATLS	ℓ +jets +$\not\!\!E_T$, CMSSM, $m_{\widetilde{q}}$=$m_{\widetilde{g}}$
$>$1200	95	[36] AAD	12CJ	ATLS	$\ell^{\pm}$+jets+$\not\!\!E_T$, CMSSM, $m_{\widetilde{q}}$=$m_{\widetilde{g}}$

$>$ 870	95	[37] AAD	12CP	ATLS	$2\gamma + \not\!\!E_T$, GMSB, bino NLSP, $m_{\widetilde{\chi}^0_1} > 50$ GeV
$>$ 950	95	[38] AAD	12W	ATLS	jets + $\not\!\!E_T$, CMSSM, $m_{\widetilde{q}} = m_{\widetilde{g}}$
		[39] CHATRCHYAN	12	CMS	e, μ, jets, razor, CMSSM
$>$ 760	95	[40] CHATRCHYAN	12AE	CMS	jets + $\not\!\!E_T$, $\widetilde{q} \to q\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1} <$ 200 GeV
$>$1110	95	[41] CHATRCHYAN	12AT	CMS	jets + $\not\!\!E_T$, CMSSM
$>$1180	95	[41] CHATRCHYAN	12AT	CMS	jets + $\not\!\!E_T$, CMSSM, $m_{\widetilde{q}}=m_{\widetilde{g}}$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$>$1080	95	[42] AABOUD	18V	ATLS	jets+$\not\!\!E_T$, Tsqk5, $(m_{\widetilde{\chi}^0_2}-m_{\widetilde{\chi}^0_1})/(m_{\widetilde{q}}-m_{\widetilde{\chi}^0_1}) < 0.95$, $m_{\widetilde{\chi}^0_1} =$ 60 GeV
$>$ 300	95	[43] KHACHATRY...	16BT	CMS	19-parameter pMSSM model, global Bayesian analysis, flat prior
	95	[44] AAD	15AI	ATLS	$\ell^\pm$ + jets + $\not\!\!E_T$
$>$1650	95	[22] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $m_{\widetilde{g}} = m_{\widetilde{q}}$, $m_{\widetilde{\chi}^0_1} = 1$ GeV
$>$ 790	95	[22] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{q} \to qW\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1} =$ 100 GeV
$>$ 820	95	[22] AAD	15BV	ATLS	2 or 3 leptons + jets, $\widetilde{q}$ decays via sleptons, $m_{\widetilde{\chi}^0_1} = 100$ GeV
$>$ 850	95	[22] AAD	15BV	ATLS	τ, $\widetilde{q}$ decays via staus, $m_{\widetilde{\chi}^0_1} = 50$ GeV
$>$ 700	95	[45] KHACHATRY...	15AR	CMS	$\widetilde{q} \to q\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \to \widetilde{S}g$, $\widetilde{S} \to S\widetilde{G}$, $S \to gg$, $m_{\widetilde{S}} = 100$ GeV, $m_S = 90$ GeV
$>$ 550	95	[45] KHACHATRY...	15AR	CMS	$\ell^\pm$, $\widetilde{q} \to q\widetilde{\chi}^\pm_1$, $\widetilde{\chi}^\pm_1 \to \widetilde{S}W^\pm$, $\widetilde{S} \to S\widetilde{G}$, $S \to gg$, $m_{\widetilde{S}} =$ 100 GeV, $m_S = 90$ GeV
$>$1500	95	[46] KHACHATRY...	15AZ	CMS	$\geq 2\ \gamma$, ≥ 1 jet, (Razor), bino-like NLSP, $m_{\widetilde{\chi}^0_1} = 375$ GeV
$>$1000	95	[46] KHACHATRY...	15AZ	CMS	$\geq 1\ \gamma$, ≥ 2 jet, wino-like NLSP, $m_{\widetilde{\chi}^0_1} = 375$ GeV
$>$ 670	95	[47] AAD	14E	ATLS	$\ell^\pm\ell^\pm(\ell^\mp)$ + jets, $\widetilde{q} \to q'\widetilde{\chi}^\pm_1$, $\widetilde{\chi}^\pm_1 \to W^{(*)\pm}\widetilde{\chi}^0_2$, $\widetilde{\chi}^0_2 \to Z^{(*)}\widetilde{\chi}^0_1$ simplified model, $m_{\widetilde{\chi}^0_1} < 300$ GeV
$>$ 780	95	[47] AAD	14E	ATLS	$\ell^\pm\ell^\pm(\ell^\mp)$ + jets, $\widetilde{q} \to q'\widetilde{\chi}^\pm_1/\widetilde{\chi}^0_2$, $\widetilde{\chi}^\pm_1 \to \ell^\pm\nu\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_2 \to \ell^\pm\ell^\mp(\nu\nu)\widetilde{\chi}^0_1$ simplified model
$>$ 700	95	[48] CHATRCHYAN	13AO	CMS	$\ell^\pm\ell^\mp$ + jets + $\not\!\!E_T$, CMSSM, $m_0 < 700$ GeV
$>$1350	95	[49] CHATRCHYAN	13AV	CMS	jets (+ leptons) + $\not\!\!E_T$, CMSSM, $m_{\widetilde{g}} = m_{\widetilde{q}}$

$>$ 800	95	[50] CHATRCHYAN	13W	CMS	$\geq$ 1 photons + jets + $\not\!\!E_T$, GGM, wino-like NLSP, $m_{\widetilde{\chi}_1^0}$ = 375 GeV
$>$1000	95	[50] CHATRCHYAN	13W	CMS	$\geq$ 2 photons + jets + $\not\!\!E_T$, GGM, bino-like NLSP, $m_{\widetilde{\chi}_1^0}$ = 375 GeV
$>$ 340	95	[51] DREINER	12A	THEO	$m_{\widetilde{q}} \sim m_{\widetilde{\chi}_1^0}$
$>$ 650	95	[52] DREINER	12A	THEO	$m_{\widetilde{q}} = m_{\widetilde{g}} \sim m_{\widetilde{\chi}_1^0}$

[1] SIRUNYAN 19AG searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two photons and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4B simplified model and on the squark mass in the Tsqk4B simplified model, see their Figure 3.

[2] SIRUNYAN 19CH searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing multiple jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A and Tglu3A simplified models, see their Figure 13. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 simplified models, see their Figure 14.

[3] SIRUNYAN 19K searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with a photon, an electron or muon, and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the chargino and neutralino mass in the Tchi1n1A simplified model, see their Figure 6. Limits are also set on the gluino mass in the Tglu4A simplified model, and on the squark mass in the Tsqk4A simplified model, see their Figure 7.

[4] AABOUD 18BJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with two opposite-sign charged leptons (electrons and muons), jets and missing transverse momentum, with various requirements to be sensitive to signals with different kinematic endpoint values in the dilepton invariant mass distribution. The data are found to be consistent with the SM expectation. Results are interpreted in the Tsqk2 model in case of $m_{\widetilde{\chi}_1^0}$ = 1 GeV: for any $m_{\widetilde{\chi}_2^0}$, squark masses below 1200 GeV are excluded, see their Fig. 14(b).

[5] AABOUD 18BV searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one jet identified as c-jet, large missing transverse energy and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tsqk1 models considering only $\widetilde{c}_1$. In scenarios with massless neutralinos, scharm masses below 850 GeV are excluded. If the differences of the $\widetilde{c}_1$ and $\widetilde{\chi}_1^0$ masses is below 100 GeV, scharm masses below 500 GeV are excluded. See their Fig.6 and Fig.7.

[6] AABOUD 18I searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one jet with a transverse momentum above 250 GeV and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tsqk1 models. In the compressed scenario with similar squark and neutralino masses, squark masses below 710 GeV are excluded. See their Fig.10(b).

[7] AABOUD 18U searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with at least one isolated photon, possibly jets and significant transverse momentum targeting generalised models of gauge-mediated SUSY breaking. No significant excess of events is observed above the SM prediction. Results are interpreted in terms of lower limits on the masses of squark in Tsqk4B models. Masses below 1820 GeV are excluded for any NLSP mass, see their Fig. 9.

[8] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tsqk1 model: squark masses below 1550 GeV are excluded for massless LSP, see their Fig. 13(a).

[9] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tsqk3 model. Assuming that $m_{\widetilde{\chi}_1^\pm}$ = 0.5 ($m_{\widetilde{q}}$ + $m_{\widetilde{\chi}_1^0}$), squark masses below 1150 GeV are excluded for massless LSP, see their Fig. 14(a). Exclusions are also shown assuming $m_{\widetilde{\chi}_1^0}$ = 60 GeV, see their Fig. 14(b).

[10] SIRUNYAN 18AA searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one photon and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in a general gauge-mediated SUSY breaking (GGM) scenario with bino-like $\widetilde{\chi}_1^0$ and wino-like $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$, see Figure 7. Limits are also set on the NLSP mass in the Tchi1n1A and Tchi1chi1A simplified models, see their Figure 8. Finally, limits are set on the gluino mass in the Tglu4A and Tglu4B simplified models, see their Figure 9, and on the squark mass in the Tskq4A and Tsqk4B simplified models, see their Figure 10.

[11] SIRUNYAN 18AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing one or more jets and significant $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see their Figure 3. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 and Tstop4 simplified models, see their Figure 3. Finally, limits are set on long-lived gluino masses in a Tglu1A simplified model where the gluino is metastable or long-lived with proper decay lengths in the range 10^{-3} mm $< c\tau < 10^5$ mm, see their Figure 4.

[12] AABOUD 17AR searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one isolated lepton, at least two jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.25 TeV are set on the 1st and 2nd generation squark masses in Tsqk3 simplified models, with $x = (m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0})$ / $(m_{\widetilde{q}} - m_{\widetilde{\chi}_1^0})$ = 1/2. Similar limits are obtained for variable x and fixed neutralino mass, $m_{\widetilde{\chi}_1^0}$ = 60 GeV. See their Figure 13.

[13] AABOUD 17N searched in 14.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with 2 same-flavour, opposite-sign leptons (electrons or muons), jets and large missing transverse momentum. The results are interpreted as 95% C.L. limits in Tsqk2 models, assuming $m_{\widetilde{\chi}_1^0}$ = 0 GeV and $m_{\widetilde{\chi}_2^0}$ = 600 GeV. See their Fig. 12 for exclusion limits as a function of $m_{\widetilde{\chi}_2^0}$.

[14] KHACHATRYAN 17P searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figures 7 and 8. Limits are also set on the squark mass in the Tsqk1 simplified model, see their Fig. 7, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 8. Finally, limits are set on the stop mass in the Tstop1, Tstop3, Tstop4, Tstop6 and Tstop7 simplified models, see Fig. 8.

[15] KHACHATRYAN 17V searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two photons and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino and squark mass in the context of general gauge mediation models Tglu4B and Tsqk4, see their Fig. 4.

[16] SIRUNYAN 17AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one photon, jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4A and Tglu4B simplified models, and on the squark mass in the Tskq4A and Tsqk4B simplified models, see their Figure 6.

[17] SIRUNYAN 17AZ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A,

Tglu3A simplified models, see their Figures 6. Limits are also set on the squark mass in the Tsqk1 simplified model (for single light squark and for 8 degenerate light squarks), on the sbottom mass in the Tsbot1 simplified model and on the stop mass in the Tstop1 simplified model, see their Fig. 7. Finally, limits are set on the stop mass in the Tstop2, Tstop4 and Tstop8 simplified models, see Fig. 8.

[18] SIRUNYAN 17P searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with multiple jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A, Tglu3A and Tglu3D simplified models, see their Fig. 12. Limits are also set on the squark mass in the Tsqk1 simplified model, on the stop mass in the Tstop1 simplified model, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 13.

[19] AABOUD 16D searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with an energetic jet and large missing transverse momentum. The results are interpreted as 95% C.L. limits on masses of first and second generation squarks decaying into a quark and the lightest neutralino in scenarios with $m_{\widetilde{q}} - m_{\widetilde{\chi}_1^0} < 25$ GeV. See their Fig. 6.

[20] AABOUD 16N searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing hadronic jets, large $\not\!\!E_T$, and no electrons or muons. No significant excess above the Standard Model expectations is observed. First- and second-generation squark masses below 1030 GeV are excluded at the 95% C.L. decaying to quarks and a massless lightest neutralino. See their Fig. 7a.

[21] KHACHATRYAN 16BS searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one energetic jet , no isolated leptons, and significant $\not\!\!E_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the squark mass in the Tskq1 simplified model, both in the assumption of a single light squark and of 8 degenerate squarks, see Fig. 11 and Table 3.

[22] AAD 15BV summarized and extended ATLAS searches for gluinos and first- and second-generation squarks in final states containing jets and missing transverse momentum, with or without leptons or b-jets in the $\sqrt{s}$ = 8 TeV data set collected in 2012. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on the squark mass in several R-parity conserving models. See their Figs. 9, 11, 18, 22, 24, 27, 28.

[23] AAD 15CS searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of pair production of squarks, decaying into a quark and a neutralino, where a photon was radiated either from an initial-state quark, from an intermediate squark, or from a final-state quark. No evidence was found for an excess above the expected level of Standard Model background and a 95% C.L. exclusion limit was set on the squark mass as a function of the squark-neutralino mass difference, see Fig. 19.

[24] AAD 15K searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing at least two jets, where the two leading jets are each identified as originating from c-quarks, and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the mass of superpartners of charm quarks ($\widetilde{c}$). Assuming that the decay $\widetilde{c} \rightarrow c\widetilde{\chi}_1^0$ takes place 100% of the time, a scalar charm mass below 490 GeV is excluded for $m_{\widetilde{\chi}_1^0} < 200$ GeV. For more details, see their Fig. 2.

[25] KHACHATRYAN 15AF searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least two energetic jets and significant $\not\!\!E_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the squark mass in simplified models where the decay $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, both for the case of a single light squark or 8 degenerate squarks, see Fig. 12. See also Table 5. Exclusions in the CMSSM, assuming tanβ = 30, $A_0 = -2$ max(m_0, $m_{1/2}$) and $\mu > 0$, are also presented, see Fig. 15.

[26] AAD 14AE searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for strongly produced supersymmetric particles in events containing jets and large missing transverse momentum, and no electrons or muons. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing squarks that decay via $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, where either a single light state or two degenerate generations of squarks are assumed, see Fig. 10.

[27] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on squark masses in simplified models where the decay $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 28. Exclusions in the CMSSM, assuming tanβ = 10, A_0 = 0 and μ > 0, are also presented, see Fig. 26.

[28] CHATRCHYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing multijets and large $\not{E}_T$. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing squarks that decay via $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$, where either a single light state or two degenerate generations of squarks are assumed, see Fig. 7a.

[29] AAD 13L searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for the production of squarks and gluinos in events containing jets, missing transverse momentum and no high-p_T electrons or muons. No excess over the expected SM background is observed. In mSUGRA/CMSSM models with tanβ = 10, A_0 = 0 and μ > 0, squarks and gluinos of equal mass are excluded for masses below 1360 GeV at 95% C.L. In a simplified model containing only squarks of the first two generations, a gluino octet and a massless neutralino, squark masses below 1320 GeV are excluded at 95% C.L. for gluino masses below 2 TeV. See Figures 10–15 for more precise bounds.

[30] AAD 13Q searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing a high-p_T isolated photon, at least one jet identified as originating from a bottom quark, and high missing transverse momentum. Such signatures may originate from supersymmetric models with gauge-mediated supersymmetry breaking in events in which one of a pair of higgsino-like neutralinos decays into a photon and a gravitino while the other decays into a Higgs boson and a gravitino. No significant excess above the expected background was found and limits were set on the squark mass as a function of the neutralino mass in a generalized GMSB model (GGM) with a higgsino-like neutralino NLSP, see their Fig. 4. For neutralino masses greater than 220 GeV, squark masses below 1020 GeV are excluded at 95% C.L.

[31] CHATRCHYAN 13 looked in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two opposite-sign leptons (e, μ, τ), jets and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in the mSUGRA/CMSSM model with tanβ = 10, A_0 = 0 and μ > 0, see Fig. 6.

[32] CHATRCHYAN 13G searched in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for the production of squarks and gluinos in events containing 0,1,2, $\geq$ 3 b-jets, missing transverse momentum and no electrons or muons. No excess over the expected SM background is observed. In mSUGRA/CMSSM models with tanβ = 10, A_0 = 0, and μ > 0, squarks and gluinos of equal mass are excluded for masses below 1250 GeV at 95% C.L. Exclusions are also derived in various simplified models, see Fig. 7.

[33] CHATRCHYAN 13H searched in 4.96 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two photons, $\geq$ 4 jets and low $\not{E}_T$ due to $\widetilde{q} \rightarrow \gamma\widetilde{\chi}_1^0$ decays in a stealth SUSY framework, where the $\widetilde{\chi}_1^0$ decays through a singlino ($\widetilde{S}$) intermediate state to $\gamma S \widetilde{G}$, with the singlet state S decaying to two jets. No significant excess above the expected background was found and limits were set in a particular R-parity conserving stealth SUSY model. The model assumes $m_{\widetilde{\chi}_1^0}$ = 0.5 $m_{\widetilde{q}}$, $m_{\widetilde{S}}$ = 100 GeV and m_S = 90 GeV. Under these assumptions, squark masses less than 1430 GeV were excluded at the 95% C.L.

[34] CHATRCHYAN 13T searched in 11.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the α_T variable to discriminate between processes with genuine and misreconstructed $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on squark masses in simplified models where the decay $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, assuming an eightfold degeneracy of the masses of the first two generation squarks, see Fig. 8 and Table 9. Also limits in the case of a single light squark are given.

[35] AAD 12AX searched in 1.04 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for supersymmetry in events containing jets, missing transverse momentum and one isolated electron or muon. No excess over the expected SM background is observed and model-independent limits are set on the cross section of new physics contributions to the signal regions. In mSUGRA/CMSSM models with tanβ = 10, A_0 = 0 and μ > 0, squarks and gluinos of equal mass are excluded for masses below 820 GeV at 95% C.L. Limits are also set on simplified models for squark production and decay via an intermediate chargino and on supersymmetric models with bilinear R-parity violation. Supersedes AAD 11G.

[36] AAD 12CJ searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events containing one or more isolated leptons (electrons or muons), jets and $\not{E}_T$. The observations are in good agreement with the SM expectations and exclusion limits have been set in number of SUSY models. In the mSUGRA/CMSSM model with tanβ = 10, A_0 = 0, and μ > 0, 95% C.L. exclusion limits have been derived for $m_{\widetilde{q}}$ < 1200 GeV, assuming equal squark and gluino masses. In minimal GMSB, values of the effective SUSY breaking scale Λ < 50 TeV are excluded at 95% C.L. for tanβ < 45. Also exclusion limits in a number of simplified models have been presented, see Figs. 10 and 12.

[37] AAD 12CP searched in 4.8 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two photons and large $\not{E}_T$ due to $\widetilde{\chi}_1^0 \rightarrow \gamma\widetilde{G}$ decays in a GMSB framework. No significant excess above the expected background was found and limits were set on the squark mass as a function of the neutralino mass in a generalized GMSB model (GGM) with a bino-like neutralino NLSP. The other sparticle masses were decoupled, tanβ = 2 and $c\tau_{NLSP}$ < 0.1 mm. Also, in the framework of the SPS8 model, a 95% C.L. lower limit was set on the breaking scale Λ of 196 TeV.

[38] AAD 12W searched in 1.04 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for the production of squarks and gluinos in events containing jets, missing transverse momentum and no electrons or muons. No excess over the expected SM background is observed. In mSUGRA/CMSSM models with tanβ = 10, A_0 = 0 and μ > 0, squarks and gluinos of equal mass are excluded for masses below 950 GeV at 95% C.L. In a simplified model containing only squarks of the first two generations, a gluino octet and a massless neutralino, squark masses below 875 GeV are excluded at 95% C.L.

[39] CHATRCHYAN 12 looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with e and/or μ and/or jets, a large total transverse energy, and $\not{E}_T$. The event selection is based on the dimensionless razor variable R, related to the $\not{E}_T$ and M_R, an indicator of the heavy particle mass scale. No evidence for an excess over the expected background is observed. Limits are derived in the CMSSM (m_0, $m_{1/2}$) plane for tanβ = 3, 10 and 50 (see Fig. 7 and 8). Limits are also obtained for Simplified Model Spectra.

[40] CHATRCHYAN 12AE searched in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least three jets and large missing transverse momentum. No significant excesses over the expected SM backgrounds are observed and 95% C.L. limits on the production cross section of squarks in a scenario where $\widetilde{q} \rightarrow q\widetilde{\chi}_1^0$ with a 100% branching ratio, see Fig. 3. For $m_{\widetilde{\chi}_1^0}$ < 200 GeV, values of $m_{\widetilde{q}}$ below 760 GeV are excluded at 95% C.L. Also limits in the CMSSM are presented, see Fig. 2.

[41] CHATRCHYAN 12AT searched in 4.73 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for the production of squarks and gluinos in events containing jets, missing transverse momentum and no electrons or muons. No excess over the expected SM background is observed. In mSUGRA/CMSSM models with tanβ = 10, A_0 = 0 and μ > 0, squarks with masses below 1110 GeV are excluded at 95% C.L. Squarks and gluinos of equal mass are excluded for masses below 1180 GeV at 95% C.L. Exclusions are also derived in various simplified models, see Fig. 6.

[42] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tsqk5 model. Squark masses below 1100 GeV are excluded if $(m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0})/(m_{\widetilde{q}} - m_{\widetilde{\chi}_1^0}) < 0.95$ and $m_{\widetilde{\chi}_1^0}$ = 60 GeV, see their Fig. 16(a).

[43] KHACHATRYAN 16BT performed a global Bayesian analysis of a wide range of CMS results obtained with data samples corresponding to 5.0 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV and in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. The set of searches considered, both individually and in combination, includes those with all-hadronic final states, same-sign and opposite-sign dileptons, and multi-lepton final states. An interpretation was given in a scan of the 19-parameter pMSSM. No scan points with a gluino mass less than 500 GeV survived and 98% of models with a squark mass less than 300 GeV were excluded.

[44] AAD 15AI searched in 20 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing at least one isolated lepton (electron or muon), jets, and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the squark masses in the CMSSM/mSUGRA, see Fig. 15, in the NUHMG, see Fig. 16, and in various simplified models, see Figs. 19–21.

[45] KHACHATRYAN 15AR searched in 19.7 of fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing jets, either a charged lepton or a photon, and low missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits are set on the squark mass in a stealth SUSY model where the decays $\widetilde{q} \to q \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to \widetilde{S} W^{\pm}$, $\widetilde{S} \to S \widetilde{G}$ and $S \to g g$, with $m_{\widetilde{S}}$ = 100 GeV and m_S = 90 GeV, take place with a branching ratio of 100%. See Fig. 6 for γ or Fig. 7 for $\ell^{\pm}$ analyses.

[46] KHACHATRYAN 15AZ searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with either at least one photon, hadronic jets and $\not{E}_T$ (single photon channel) or with at least two photons and at least one jet and using the razor variables. No significant excess above the Standard Model expectations is observed. Limits are set on gluino masses in the general gauge-mediated SUSY breaking model (GGM), for both a bino-like and wino-like neutralino NLSP scenario, see Fig. 8 and 9.

[47] AAD 14E searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for strongly produced supersymmetric particles in events containing jets and two same-sign leptons or three leptons. The search also utilises jets originating from b-quarks, missing transverse momentum and other variables. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing gluinos and squarks, see Figures 5 and 6. In the $\widetilde{q} \to q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{(*)\pm} \widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \to Z^{(*)} \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^{\pm}} = 0.5\, m_{\widetilde{\chi}_1^0} + m_{\widetilde{g}}$, $m_{\widetilde{\chi}_2^0} = 0.5\, (m_{\widetilde{\chi}_1^0} + m_{\widetilde{\chi}_1^{\pm}})$. In the $\widetilde{q} \to q' \widetilde{\chi}_1^{\pm}$ or $\widetilde{q} \to q' \widetilde{\chi}_2^0$, $\widetilde{\chi}_1^{\pm} \to \ell^{\pm} \nu \widetilde{\chi}_1^0$ or $\widetilde{\chi}_2^0 \to \ell^{\pm} \ell^{\mp} (\nu\nu) \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0} = 0.5\, (m_{\widetilde{\chi}_1^0} + m_{\widetilde{q}})$, $m_{\widetilde{\chi}_1^0} < 460$ GeV. Limits are also derived in the mSUGRA/CMSSM, bRPV and GMSB models, see their Fig. 8.

[48] CHATRCHYAN 13AO searched in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two opposite-sign isolated leptons accompanied by hadronic jets and $\not{E}_T$. No significant excesses over the expected SM backgrounds are observed and 95% C.L. exclusion limits are derived in the mSUGRA/CMSSM model with tanβ = 10, A_0 = 0 and $\mu > 0$, see Fig. 8.

[49] CHATRCHYAN 13AV searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for new heavy particle pairs decaying into jets (possibly b-tagged), leptons and $\not{E}_T$ using the Razor variables. No significant excesses over the expected SM backgrounds are observed and 95% C.L. exclusion limits are derived in the mSUGRA/CMSSM model with tanβ =

10, $A_0 = 0$ and $\mu > 0$, see Fig. 3. The results are also interpreted in various simplified models, see Fig. 4.

[50] CHATRCHYAN 13W searched in 4.93 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events with one or more photons, hadronic jets and $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on squark masses in the general gauge-mediated SUSY breaking model (GGM), for both a wino-like and bino-like neutralino NLSP scenario, see Fig. 5.

[51] DREINER 12A reassesses constraints from CMS (at 7 TeV, $\sim$ 4.4 fb^{-1}) under the assumption that the fist and second generation squarks and the lightest SUSY particle are quasi-degenerate in mass (compressed spectrum).

[52] DREINER 12A reassesses constraints from CMS (at 7 TeV, $\sim$ 4.4 fb^{-1}) under the assumption that the first and second generation squarks, the gluino, and the lightest SUSY particle are quasi-degenerate in mass (compressed spectrum).

R-parity violating $\widetilde{q}$ (Squark) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
none 100–720	95	[1] SIRUNYAN	18EA	CMS	2 large jets with four-parton substructure, $\widetilde{q} \to 4q$
>1600	95	[2] KHACHATRY...	16BX	CMS	$\widetilde{q} \to q\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \to \ell\ell\nu$, λ_{121} or $\lambda_{122} \neq 0$, $m_{\widetilde{g}} = 2400$ GeV
>1000	95	[3] AAD	15CB	ATLS	jets, $\widetilde{q} \to q\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \to \ell q q$, $m_{\widetilde{\chi}_1^0} = 108$ GeV and $2.5 < c\tau_{\widetilde{\chi}_1^0} < 200$ mm
		[4] AAD	12AX	ATLS	ℓ +jets $+\not\!\!E_T$, CMSSM, $m_{\widetilde{q}}=m_{\widetilde{g}}$
		[5] CHATRCHYAN	12AL	CMS	$\geq 3\ell^{\pm}$

[1] SIRUNYAN 18EA searched in 38.2 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for the pair production of resonances, each decaying to at least four quarks. Reconstructed particles are clustered into two large jets of similar mass, each consistent with four-parton substructure. No statistically significant excess over the Standard Model expectation is observed. Limits are set on the squark and gluino mass in RPV supersymmetry models where squarks (gluinos) decay, through intermediate higgsinos, to four (five) quarks, see their Figure 4.

[2] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing 4 leptons coming from R-parity-violating decays of $\widetilde{\chi}_1^0 \to \ell\ell\nu$ with $\lambda_{121} \neq 0$ or $\lambda_{122} \neq 0$. No excess over the expected background is observed. Limits are derived on the gluino, squark and stop masses, see Fig. 23.

[3] AAD 15CB searched for events containing at least one long-lived particle that decays at a significant distance from its production point (displaced vertex, DV) into two leptons or into five or more charged particles in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV. The dilepton signature is characterised by DV formed from at least two lepton candidates. Four different final states were considered for the multitrack signature, in which the DV must be accompanied by a high-transverse momentum muon or electron candidate that originates from the DV, jets or missing transverse momentum. No events were observed in any of the signal regions. Results were interpreted in SUSY scenarios involving R-parity violation, split supersymmetry, and gauge mediation. See their Fig. 14–20.

[4] AAD 12AX searched in 1.04 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for supersymmetry in events containing jets, missing transverse momentum and one isolated electron or muon. No excess over the expected SM background is observed and model-independent limits are set on the cross section of new physics contributions to the signal regions. In mSUGRA/CMSSM models with $\tan\beta = 10$, $A_0 = 0$ and $\mu > 0$, squarks and gluinos of equal mass are excluded for masses below 820 GeV at 95% C.L. Limits are also set on simplified models for squark production and decay via an intermediate chargino and on supersymmetric models with bilinear R-parity violation. Supersedes AAD 11G.

[5] CHATRCHYAN 12AL looked in 4.98 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for anomalous production of events with three or more isolated leptons. Limits on squark and gluino masses are set in RPV SUSY models with leptonic $LL\overline{E}$couplings, λ_{123} >0.05, and hadronic $\overline{UDD}$ couplings, $\lambda''_{112}>0.05$, see their Fig. 5. In the $\overline{UDD}$ case the leptons arise from supersymmetric cascade decays. A very specific supersymmetric spectrum is assumed. All decays are prompt.

Long-lived $\widetilde{q}$ (Squark) mass limit

The following are bounds on long-lived scalar quarks, assumed to hadronise into hadrons with lifetime long enough to escape the detector prior to a possible decay. Limits may depend on the mixing angle of mass eigenstates: $\widetilde{q}_1=\widetilde{q}_L\cos\theta_q+\widetilde{q}_R\sin\theta_q$. The coupling to the Z^0 boson vanishes for up-type squarks when θ_u=0.98, and for down type squarks when θ_d=1.17.

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1250	95	[1] AABOUD	19AT	ATLS	$\widetilde{b}$ R-hadrons
>1340	95	[2] AABOUD	19AT	ATLS	$\widetilde{t}$ R-hadrons
>1600	95	[3] SIRUNYAN	19BH	CMS	long-lived $\widetilde{t}$, RPV, $\widetilde{t}\to\overline{d}\,\overline{d}$, 10 mm $<c\tau<$ 110 mm
>1350	95	[3] SIRUNYAN	19BH	CMS	long-lived $\widetilde{t}$, RPV, $\widetilde{t}\to b\ell$, 7 mm $<c\tau<$ 110 mm
> 805	95	[4] AABOUD	16B	ATLS	$\widetilde{b}$ R-hadrons
> 890	95	[5] AABOUD	16B	ATLS	$\widetilde{t}$ R-hadrons
>1040	95	[6] KHACHATRY...	16BW	CMS	$\widetilde{t}$ R-hadrons, cloud interaction model
>1000	95	[6] KHACHATRY...	16BW	CMS	$\widetilde{t}$ R-hadrons, charge-suppressed interaction model
> 845	95	[7] AAD	15AE	ATLS	$\widetilde{b}$ R-hadron, stable, Regge model
> 900	95	[7] AAD	15AE	ATLS	$\widetilde{t}$ R-hadron, stable, Regge model
>1500	95	[7] AAD	15AE	ATLS	$\widetilde{g}$ decaying to 300 GeV stable sleptons, LeptoSUSY model
> 751	95	[8] AAD	15BM	ATLS	$\widetilde{b}$ R-hadron, stable, Regge model
> 766	95	[8] AAD	15BM	ATLS	$\widetilde{t}$ R-hadron, stable, Regge model
> 525	95	[9] KHACHATRY...	15AK	CMS	$\widetilde{t}$ R-hadrons, 10 μs$<\tau<$1000 s
> 470	95	[9] KHACHATRY...	15AK	CMS	$\widetilde{t}$ R-hadrons, 1 μs$<\tau<$1000 s
• • • We do not use the following data for averages, fits, limits, etc. • • •					
> 683	95	[10] AAD	13AA	ATLS	$\widetilde{t}$, R-hadrons, generic interaction model
> 612	95	[11] AAD	13AA	ATLS	$\widetilde{b}$, R-hadrons, generic interaction model
> 344	95	[12] AAD	13BC	ATLS	R-hadrons, $\widetilde{t}\to b\widetilde{\chi}^0_1$, Regge model, lifetime between 10^{-5} and 10^3 s, $m_{\widetilde{\chi}^0_1}=100$ GeV
> 379	95	[13] AAD	13BC	ATLS	R-hadrons, $\widetilde{t}\to t\widetilde{\chi}^0_1$, Regge model, lifetime between 10^{-5} and 10^3 s, $m_{\widetilde{\chi}^0_1}=100$ GeV
> 935	95	[14] CHATRCHYAN	13AB	CMS	long-lived $\widetilde{t}$ forming R-hadrons, cloud interaction model

[1] AABOUD 19AT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for metastable and stable R-hadrons. Multiple search strategies for a wide range of lifetimes, corresponding to path lengths of a few meters, are defined. No significant deviations from the expected Standard Model background are observed. Sbottom R-hadrons are excluded at 95%

C.L. for masses below 1250 GeV. Less stringent constraints are achieved with the muon-spectrometer agnostic analysis. See their Figure 9 (bottom-left).

[2] AABOUD 19AT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for metastable and stable R-hadrons. Multiple search strategies for a wide range of lifetimes, corresponding to path lengths of a few meters, are defined. No significant deviations from the expected Standard Model background are observed. Stop R-hadrons are excluded at 95% C.L. for masses below 1340 GeV. Similar constraints are achieved with the muon-spectrometer agnostic analysis. See their Figure 9 (bottom-right).

[3] SIRUNYAN 19BH searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for long-lived particles decaying into jets, with each long-lived particle having a decay vertex well displaced from the production vertex. The selected events are found to be consistent with standard model predictions. Limits are set on the gluino mass in a GMSB model where the gluino is decaying via $\widetilde{g} \rightarrow g\widetilde{G}$, see their Figure 4 and in an RPV model of supersymmetry where the gluino is decaying via $\widetilde{g} \rightarrow \overline{t}\,\overline{b}\,\overline{s}$, see their Figures 5. Limits are also set on the stop mass in two RPV models, see their Figure 6 (for $\widetilde{t} \rightarrow b\ell$ decays) and Figure 7 (for $\widetilde{t} \rightarrow \overline{d}\,\overline{d}$ decays).

[4] AABOUD 16B searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for long-lived R-hadrons using observables related to large ionization losses and slow propagation velocities, which are signatures of heavy charged particles traveling significantly slower than the speed of light. Exclusion limits at 95% C.L. are set on the long-lived sbottom masses exceeding 805 GeV. See their Fig. 5.

[5] AABOUD 16B searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for long-lived R-hadrons using observables related to large ionization losses and slow propagation velocities, which are signatures of heavy charged particles traveling significantly slower than the speed of light. Exclusion limits at 95% C.L. are set on the long-lived stop masses exceeding 890 GeV. See their Fig. 5.

[6] KHACHATRYAN 16BW searched in 2.5 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with heavy stable charged particles, identified by their anomalously high energy deposits in the silicon tracker and/or long time-of-flight measurements by the muon system. No evidence for an excess over the expected background is observed. Limits are derived for pair production of top squarks as a function of mass, depending on the interaction model, see Fig. 4 and Table 7.

[7] AAD 15AE searched in 19.1 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for heavy long-lived charged particles, measured through their specific ionization energy loss in the ATLAS pixel detector or their time-of-flight in the ALTAS muon system. In the absence of an excess of events above the expected backgrounds, limits are set R-hadrons in various scenarios, see Fig. 11. Limits are also set in LeptoSUSY models where the gluino decays to stable 300 GeV leptons, see Fig. 9.

[8] AAD 15BM searched in 18.4 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for stable and metastable non-relativistic charged particles through their anomalous specific ionization energy loss in the ATLAS pixel detector. In absence of an excess of events above the expected backgrounds, limits are set on stable bottom and top squark R-hadrons, see Table 5.

[9] KHACHATRYAN 15AK looked in a data set corresponding to fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV, and a search interval corresponding to 281 h of trigger lifetime, for long-lived particles that have stopped in the CMS detector. No evidence for an excess over the expected background in a cloud interaction model is observed. Assuming the decay $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ and lifetimes between 1 μs and 1000 s, limits are derived on $\widetilde{t}$ production as a function of $m_{\widetilde{\chi}_1^0}$, see Figs. 4 and 7. The exclusions require that $m_{\widetilde{\chi}_1^0}$ is kinematically consistent with the minimum values of the jet energy thresholds used.

[10] AAD 13AA searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events containing colored long-lived particles that hadronize forming R-hadrons. No significant excess above the expected background was found. Long-lived R-hadrons containing a $\widetilde{t}$ are excluded for masses up to 683 GeV at 95% C.L in a general interaction model. Also, limits independent of the fraction of R-hadrons that arrive charged in the muon system were derived, see Fig. 6.

[11] AAD 13AA searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events containing colored long-lived particles that hadronize forming R-hadrons. No significant excess above the expected background was found. Long-lived R-hadrons containing a $\widetilde{b}$ are excluded for masses up to 612 GeV at 95% C.L in a general interaction model. Also, limits independent of the fraction of R-hadrons that arrive charged in the muon system were derived, see Fig. 6.

[12] AAD 13BC searched in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV and in 22.9 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for bottom squark R-hadrons that have come to rest within the ATLAS calorimeter and decay at some later time to hadronic jets and a neutralino. In absence of an excess of events above the expected backgrounds, limits are set on sbottom masses for the decay $\widetilde{b} \rightarrow b\widetilde{\chi}^0_1$, for different lifetimes, and for a neutralino mass of 100 GeV, see their Table 6 and Fig 10.

[13] AAD 13BC searched in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV and in 22.9 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for bottom squark R-hadrons that have come to rest within the ATLAS calorimeter and decay at some later time to hadronic jets and a neutralino. In absence of an excess of events above the expected backgrounds, limits are set on stop masses for the decay $\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, for different lifetimes, and for a neutralino mass of 100 GeV, see their Table 6 and Fig 10.

[14] CHATRCHYAN 13AB looked in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV and in 18.8 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{t}_1$'s. No evidence for an excess over the expected background is observed. Limits are derived for pair production of stops as a function of mass in the cloud interaction model (see Fig. 8 and Table 6). In the charge-suppressed model, the limit decreases to 818 GeV.

$\widetilde{b}$ (Sbottom) mass limit

Limits in e^+e^- depend on the mixing angle of the mass eigenstate $\widetilde{b}_1 = \widetilde{b}_L\cos\theta_b + \widetilde{b}_R\sin\theta_b$. Coupling to the Z vanishes for $\theta_b \sim 1.17$. As a consequence, no absolute constraint in the mass region $\lesssim 40$ GeV is available in the literature at this time from e^+e^- collisions. In the Listings below, we use $\Delta m = m_{\widetilde{b}_1} - m_{\widetilde{\chi}^0_1}$.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

R-parity conserving $\widetilde{b}$ (Sbottom) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>750	95	[1] AAD	20V	ATLS	same-sign $\ell^\pm\ell^\pm$ + jets, Tsbot2, $m_{\widetilde{\chi}^\pm_1} = m_{\widetilde{\chi}^0_1} + 100$ GeV, $m_{\widetilde{\chi}^0_1} \sim 50$ GeV
>850	95	[2] SIRUNYAN	20T	CMS	same-sign $\ell^\pm\ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tsbot2, $m_{\widetilde{\chi}^\pm_1} < 800$ GeV, $m_{\widetilde{\chi}^0_1} = 50$ GeV
>1500	95	[3] AAD	19H	ATLS	≥ 3 b-jets + $\not{E}_T$, Tsbot4, ≥ 1 $h(\rightarrow b\overline{b})$, $m_{\widetilde{\chi}^0_1} = 60$ GeV
>1300	95	[4] AAD	19H	ATLS	≥ 3 b-jets+$\not{E}_T$, Tsbot4, $\geq 1h(\rightarrow b\overline{b})$, $m_{\widetilde{\chi}^0_2} = m_{\widetilde{\chi}^0_1}$ +130 GeV

>1220	95	[5] SIRUNYAN	19CH	CMS	jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 530	95	[6] SIRUNYAN	19CI	CMS	≥ 1 H ($\rightarrow$ $\gamma\gamma$) + jets + $\not\!\!E_T$, Tsbot4, $m_{\widetilde{\chi}^0_2}$ = $m_{\widetilde{\chi}^0_1}$ + 130 GeV, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
> 430	95	[7] AABOUD	18I	ATLS	$\geq$ 1 jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{b}}$ − $m_{\widetilde{\chi}^0_1}$ $\sim$ m_b
> 840	95	[8] SIRUNYAN	18AL	CMS	$\geq 3\ell^{\pm}$ + jets + $\not\!\!E_T$, Tsbot2, $m_{\widetilde{\chi}^0_1}$ = 50 GeV
> 975	95	[9] SIRUNYAN	18AR	CMS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not\!\!E_T$, Tsbot3, $m_{\widetilde{\ell}}$= ($m_{\widetilde{\chi}^0_2}$+$m_{\widetilde{\chi}^0_1}$)/2, $m_{\widetilde{\chi}^0_1}$= 100 GeV
>1060	95	[10] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1230	95	[11] SIRUNYAN	18B	CMS	jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 420	95	[12] SIRUNYAN	18X	CMS	≥ 1 H ($\rightarrow$ $\gamma\gamma$) + jets + $\not\!\!E_T$, Tsbot4, $m_{\widetilde{\chi}^0_2}$ = $m_{\widetilde{\chi}^0_1}$ + 130 GeV, $m_{\widetilde{\chi}^0_1}$ < 225 GeV
> 700	95	[13] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not\!\!E_T$, Tsbot2, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 950	95	[14] AABOUD	17AX	ATLS	2 b-jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 880	95	[15] AABOUD	17AX	ATLS	2 b-jets + $\not\!\!E_T$, mixture Tsbot1 and Tsbot2 BR=50%, $m_{\widetilde{\chi}^0_1}$ = 0 GeV, $m_{\widetilde{\chi}^{\pm}_1}$ − $m_{\widetilde{\chi}^0_1}$ = 1 GeV
> 315	95	[16] KHACHATRY...	17A	CMS	2 VBF jets + $\not\!\!E_T$, Tsbot1, $m_{\widetilde{b}}$− $m_{\widetilde{\chi}^0_1}$ = 5 GeV
> 450	95	[17] KHACHATRY...	17AW	CMS	$\geq 3\ell^{\pm}$, 2 jets, Tsbot2, $m_{\widetilde{\chi}^0_1}$ = 50 GeV, $m_{\widetilde{\chi}^{\pm}_1}$ = 200 GeV
> 800	95	[18] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1175	95	[19] SIRUNYAN	17AZ	CMS	$\geq$ 1 jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 890	95	[20] SIRUNYAN	17K	CMS	jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 810	95	[21] SIRUNYAN	17S	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets + $\not\!\!E_T$, Tsbot2, $m_{\widetilde{\chi}^0_1}$ = 50 GeV, $m_{\widetilde{\chi}^{\pm}_1}$ = 100 GeV
> 323	95	[22] AABOUD	16D	ATLS	≥ 1 jet + $\not\!\!E_T$, Tsbot1, $m_{\widetilde{b}_1}$ −$m_{\widetilde{\chi}^0_1}$ = 5 GeV
> 840	95	[23] AABOUD	16Q	ATLS	2 b-jets + $\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
> 540	95	[24] AAD	16BB	ATLS	2 same-sign/3ℓ + jets + $\not\!\!E_T$, Tsbot2, $m_{\widetilde{\chi}^0_1}$ < 55 GeV

>680	95	[25] KHACHATRY...	16BJ	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, Tsbot2, $m_{\widetilde{\chi}_1^{\pm}} <$ 550 GeV, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
>500	95	[25] KHACHATRY...	16BJ	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, Tsbot2, $m_{\widetilde{b}} - m_{\widetilde{\chi}_1^{\pm}}$ <100 GeV, $m_{\widetilde{\chi}_1^0}$=50 GeV
>880	95	[26] KHACHATRY...	16BS	CMS	jets + $\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>550	95	[27] KHACHATRY...	16BY	CMS	opposite-sign $\ell^{\pm}\ell^{\pm}$, Tsbot3, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>600	95	[28] AAD	15CJ	ATLS	$\widetilde{b} \to b\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ < 250 GeV
>440	95	[28] AAD	15CJ	ATLS	$\widetilde{b} \to t\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{(*)}\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 60 GeV, $m_{\widetilde{b}} - m_{\widetilde{\chi}_1^{\pm}} < m_t$
none 300–650	95	[28] AAD	15CJ	ATLS	$\widetilde{b} \to \widetilde{b}b\widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \to h\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 60 GeV, $m_{\widetilde{\chi}_2^0}$ > 250 GeV
>640	95	[29] KHACHATRY...	15AF	CMS	$\widetilde{b} \to b\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} = 0$
>650	95	[30] KHACHATRY...	15AH	CMS	$\widetilde{b} \to b\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} = 0$
>250	95	[30] KHACHATRY...	15AH	CMS	$\widetilde{b} \to b\widetilde{\chi}_1^0$, $m_{\widetilde{b}} - m_{\widetilde{\chi}_1^0}$ < 10 GeV
>570	95	[31] KHACHATRY...	15I	CMS	$\widetilde{b} \to t\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{\pm}\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ =50 GeV, 150<$m_{\widetilde{\chi}_1^{\pm}}$ <300 GeV
>255	95	[32] AAD	14T	ATLS	$\widetilde{b}_1 \to b\widetilde{\chi}_1^0$, $m_{\widetilde{b}_1} - m_{\widetilde{\chi}_1^0} \approx m_b$
>400	95	[33] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\widetilde{b} \to b\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
		[34] CHATRCHYAN	14R	CMS	$\geq 3\ell^{\pm}$, $\widetilde{b} \to t\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ = 50 GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

		[35] KHACHATRY...	15AD	CMS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not\!\!E_T$, $\widetilde{b} \to b\ell^{\pm}\ell^{\mp}\widetilde{\chi}_1^0$
none 340–600	95	[36] AAD	14AX	ATLS	$\geq$ 3 b-jets + $\not\!\!E_T$, $\widetilde{b} \to b\widetilde{\chi}_2^0$ simplified model with $\widetilde{\chi}_2^0 \to h\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$=60 GeV, $m_{\widetilde{\chi}_2^0}$=300 GeV
>440	95	[37] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{b}_1 \to t\widetilde{\chi}_1^{\pm}$ with $\widetilde{\chi}_1^{\pm} \to W^{(*)\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}} = 2\ m_{\widetilde{\chi}_1^0}$
>500	95	[38] CHATRCHYAN	14H	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, $\widetilde{b} \to t\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}}$ = 2 GeV, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>620	95	[39] AAD	13AU	ATLS	2 b-jets + $\not\!\!E_T$, $\widetilde{b}_1 \to b\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} <$ 120 GeV

>550	95	[40] CHATRCHYAN	13AT	CMS	jets + $\not\!\!E_T$, $\widetilde{b} \rightarrow b\widetilde{\chi}^0_1$ simplified model, $m_{\widetilde{\chi}^0_1}$= 50 GeV
>600	95	[41] CHATRCHYAN	13T	CMS	jets + $\not\!\!E_T$, $\widetilde{b} \rightarrow b\widetilde{\chi}^0_1$ simplified model, $m_{\widetilde{\chi}^0_1}$= 0 GeV
>450	95	[42] CHATRCHYAN	13V	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ + $\geq$ 2 b-jets, $\widetilde{b} \rightarrow t\widetilde{\chi}^{\pm}_1$, $\widetilde{\chi}^{\pm}_1 \rightarrow W^{\pm}\widetilde{\chi}^0_1$ simplified model, $m_{\widetilde{\chi}^0_1}$ = 50 GeV
>390		[43] AAD	12AN	ATLS	$\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$, simplified model, $m_{\widetilde{\chi}^0_1} < 60$ GeV
		[44] CHATRCHYAN	12AI	CMS	$\ell^{\pm}\ell^{\pm}$ + b-jets + $\not\!\!E_T$
>410	95	[45] CHATRCHYAN	12BO	CMS	$\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$, simplified model, $m_{\widetilde{\chi}^0_1}$ = 50 GeV
>294	95	[46] AAD	11K	ATLS	stable $\widetilde{b}$
		[47] AAD	11O	ATLS	$\widetilde{g} \rightarrow \widetilde{b}_1 b$, $\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$=60 GeV
		[48] CHATRCHYAN	11D	CMS	$\widetilde{b}$,$\widetilde{t} \rightarrow b$
>230	95	[49] AALTONEN	10R	CDF	$\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1} < 70$ GeV
>247	95	[50] ABAZOV	10L	D0	$\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV

[1] AAD 20V searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two same-sign charged leptons (electrons or muons) and jets. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on the bottom squark masses in the Tsbot2 simplified model for $m_{\widetilde{\chi}^{\pm}_1} = m_{\widetilde{\chi}^0_1}$ + 100 GeV, see their Fig. 8(a).

[2] SIRUNYAN 20T searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least two jets, and two isolated same-sign or three or more charged leptons (electrons or muons). No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figure 7, and in the Tglu1C and Tglu1B simplified models, see their Figures 8 and 9. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 10, and on the stop mass in the Tstop7 simplified model, see their Figure 11. Finally, limits are set on the gluino mass in RPV simplified models where the gluino decays either via $\widetilde{g} \rightarrow q q \overline{q} \overline{q} + e/\mu/\tau$ or via $\widetilde{g} \rightarrow t b s$, see Figure 12.

[3] AAD 19H searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with no charged leptons, three or more b-jets, and large $\not\!\!E_T$. Higgs boson candidates are reconstructed as b-jet pairs. No significant excess above the Standard Model expectations is observed. Limits up to 1500 GeV are set on the sbottom mass in the Tsbot4 simplified model, see Figure 8(a), for fixed $m_{\widetilde{\chi}^0_1}$ = 60 GeV and for $m_{\widetilde{\chi}^0_2}$ up to 1200 GeV.

[4] AAD 19H searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with no charged leptons, three or more b-jets, and large $\not\!\!E_T$. Higgs boson candidates are reconstructed as b-jet pairs. No significant excess above the Standard Model expectations is observed. Limits up to 1300 GeV are set on the sbottom mass in the Tsbot4 simplified model, see Figure 8(b), for $m_{\widetilde{\chi}^0_2} = m_{\widetilde{\chi}^0_1}$ + 130 GeV and $m_{\widetilde{\chi}^0_2}$ from 200 to 750 GeV.

[5] SIRUNYAN 19CH searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing multiple jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A and Tglu3A simplified models, see their Figure 13. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 simplified models, see their Figure 14.

[6] SIRUNYAN 19CI searched in 77.5 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model, see Figure 3, and on the wino mass in the Tchi1n2E simplified model, see their Figure 4. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 5.

[7] AABOUD 18I searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one jet with a transverse momentum above 250 GeV and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tsbot1 models. In the compressed scenario with sbottom and neutralino masses differing by m_b, sbottom masses below 430 GeV are excluded. For $m_{\widetilde{\chi}^0_1} = 0$ they exclude sbottom masses up to 610 GeV. See their Fig.10(a).

[8] SIRUNYAN 18AL searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least three charged leptons, in any combination of electrons and muons, jets and significant $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1C simplified models, see their Figure 5. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 6, and on the stop mass in the Tstop7 simplified model, see their Figure 7.

[9] SIRUNYAN 18AR searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing two opposite-charge, same-flavour leptons (electrons or muons), jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4C simplified model, see their Figure 7. Limits are also set on the chargino/neutralino mass in the Tchi1n2F simplified model, see their Figure 8, and on the neutralino mass in the Tn1n1B and Tn1n1C simplified models, see their Figure 9. Finally, limits are set on the sbottom mass in the Tsbot3 simplified model, see their Figure 10.

[10] SIRUNYAN 18AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing one or more jets and significant $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see their Figure 3. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 and Tstop4 simplified models, see their Figure 3. Finally, limits are set on long-lived gluino masses in a Tglu1A simplified model where the gluino is metastable or long-lived with proper decay lengths in the range 10^{-3} mm $< c\tau < 10^5$ mm, see their Figure 4.

[11] SIRUNYAN 18B searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for the pair production of third-generation squarks in events with jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot1 simplified model, see their Figure 5, and on the stop mass in the Tstop4 simplified model, see their Figure 6.

[12] SIRUNYAN 18X searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of photons, jets and $\not{E}_T$. The razor variables (M_R and R^2) are used to categorise the events. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot4 simplified model and on the wino mass in the Tchi1n2E simplified model, see their Figure 5. Limits are also set on the higgsino mass in the Tn1n1A and Tn1n1B simplified models, see their Figure 6.

[13] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 700 GeV are set on the bottom squark mass in Tsbot2 simplified models assuming $m_{\widetilde{\chi}^0_1} = 0$ GeV. See their Figure 4(d).

[14] AABOUD 17AX searched in 36 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing two jets identified as originating from b-quarks and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of bottom squarks. In the Tsbot1

simplified model, a $\widetilde{b}_1$ mass below 950 GeV is excluded for $m_{\widetilde{\chi}^0_1} = 0$ (<420) GeV. See their Fig. 7(a).

[15] AABOUD 17AX searched in 36 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing two jets identified as originating from b-quarks and large missing transverse momentum, with or without leptons. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of bottom squarks. Assuming 50% BR for Tsbot1 and Tsbot2 simplified models, a $\widetilde{b}_1$ mass below 880 (860) GeV is excluded for $m_{\widetilde{\chi}^0_1} = 0$ (<250) GeV. See their Fig. 7(b).

[16] KHACHATRYAN 17A searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with two forward jets, produced through vector boson fusion, and missing transverse momentum. No significant excess above the Standard Model expectations is observed. A limit is set on sbottom masses in the Tsbot1 simplified model, see Fig. 3.

[17] KHACHATRYAN 17AW searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least three charged leptons, in any combination of electrons and muons, and significant $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1C simplified models, and on the sbottom mass in the Tsbot2 simplified model, see their Figure 4.

[18] KHACHATRYAN 17P searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figures 7 and 8. Limits are also set on the squark mass in the Tsqk1 simplified model, see their Fig. 7, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 8. Finally, limits are set on the stop mass in the Tstop1, Tstop3, Tstop4, Tstop6 and Tstop7 simplified models, see Fig. 8.

[19] SIRUNYAN 17AZ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more jets and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A simplified models, see their Figures 6. Limits are also set on the squark mass in the Tsqk1 simplified model (for single light squark and for 8 degenerate light squarks), on the sbottom mass in the Tsbot1 simplified model and on the stop mass in the Tstop1 simplified model, see their Fig. 7. Finally, limits are set on the stop mass in the Tstop2, Tstop4 and Tstop8 simplified models, see Fig. 8.

[20] SIRUNYAN 17K searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct production of stop or sbottom pairs in events with multiple jets and significant $\not\!\!E_T$. A second search also requires an isolated lepton and is combined with the all-hadronic search. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop8 and Tstop4 simplified models, see their Figures 7, 8 and 9 (for the Tstop4 limits, only the results of the all-hadronic search are used). Limits are also set on the sbottom mass in the Tsbot1 simplified model, see Fig. 10 (also here, only the results of the all-hadronic search are used).

[21] SIRUNYAN 17S searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two isolated same-sign leptons, jets, and large $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the mass of the gluino mass in the Tglu3A, Tglu3B, Tglu3C, Tglu3D and Tglu1B simplified models, see their Figures 5 and 6, and on the sbottom mass in the Tsbot2 simplified model, see their Figure 6.

[22] AABOUD 16D searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with an energetic jet and large missing transverse momentum. The results are interpreted as 95%C.L. limits on mass of sbottom decaying into a b-quark and the lightest neutralino in scenarios with $m_{\widetilde{b}_1} - m_{\widetilde{\chi}^0_1}$ between 5 and 20 GeV. See their Fig. 6.

[23] AABOUD 16Q searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing two jets identified as originating from b-quarks and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks. Assuming that the decay $\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$ (Tsbot1) takes place 100% of the time, a $\widetilde{b}_1$ mass below 840

(800) GeV is excluded for $m_{\widetilde{\chi}_1^0} < 100$ (360) GeV. Differences in mass above 100 GeV between the $\widetilde{b}_1$ and the $\widetilde{\chi}_1^0$ are excluded up to a $\widetilde{b}_1$ mass of 500 GeV. For more details, see their Fig. 4.

[24] AAD 16BB searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with exactly two same-sign leptons or at least three leptons, multiple hadronic jets, b-jets, and $\not{E}_T$. No significant excess over the Standard Model expectation is found. Exclusion limits at 95% C.L. are set on the sbottom mass for the Tsbot2 model, assuming $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_1^0} +$ 100 GeV. See their Fig. 4c.

[25] KHACHATRYAN 16BJ searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot2 simplified model, see Fig. 6.

[26] KHACHATRYAN 16BS searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one energetic jet , no isolated leptons, and significant $\not{E}_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot1 simplified model, see Fig. 11 and Table 3.

[27] KHACHATRYAN 16BY searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two opposite-sign, same-flavour leptons, jets, and missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4C simplified model, see Fig. 4, and on sbottom masses in the Tsbot3 simplified model, see Fig. 5.

[28] AAD 15CJ searched in 20 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for evidence of third generation squarks by combining a large number of searches covering various final states. Limits on the sbottom mass are shown, either assuming the $\widetilde{b} \rightarrow b\widetilde{\chi}_1^0$ decay, see Fig. 11, or assuming the $\widetilde{b} \rightarrow t\widetilde{\chi}_1^\pm$ decay, with $\widetilde{\chi}_1^\pm \rightarrow W^{(*)}\widetilde{\chi}_1^0$, see Fig. 12a, or assuming the $\widetilde{b} \rightarrow b\widetilde{\chi}_2^0$ decay, with $\widetilde{\chi}_2^0 \rightarrow h\widetilde{\chi}_1^0$, see Fig. 12b. Interpretations in the pMSSM are also discussed, see Figures 13–15.

[29] KHACHATRYAN 15AF searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least two energetic jets and significant $\not{E}_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in simplified models where the decay $\widetilde{b} \rightarrow b\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 12. See also Table 5. Exclusions in the CMSSM, assuming tan$\beta = 30$, $A_0 = -2$ max$(m_0, m_{1/2})$ and $\mu > 0$, are also presented, see Fig. 15.

[30] KHACHATRYAN 15AH searched in 19.4 or 19.7 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing either a fully reconstructed top quark, or events containing dijets requiring one or both jets to originate from b-quarks, or events containing a mono-jet. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in simplified models where the decay $\widetilde{b} \rightarrow b\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 12. Limits are also set in a simplified model where the decay $\widetilde{b} \rightarrow c\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 12.

[31] KHACHATRYAN 15I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events in which b-jets and four W-bosons are produced. Five individual search channels are combined (fully hadronic, single lepton, same-sign dilepton, opposite-sign dilepton, multilepton). No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in a simplified model where the decay $\widetilde{b} \rightarrow t\widetilde{\chi}_1^\pm$, with $\widetilde{\chi}_1^\pm \rightarrow W^\pm\widetilde{\chi}_1^0$, takes place with a branching ratio of 100%, see Fig. 7.

[32] AAD 14T searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for monojet-like events. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks in simplified

models which assume that the decay $\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$ takes place 100% of the time, see Fig. 12.

[33] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. A second analysis requires at least one of the jets to be originating from a b-quark. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{b} \rightarrow b\widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, see Figs. 28 and 29. Exclusions in the CMSSM, assuming tanβ = 10, A_0 = 0 and μ >0, are also presented, see Fig. 26.

[34] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in a simplified model where the decay $\widetilde{b} \rightarrow t\widetilde{\chi}^{\pm}_1$, with $\widetilde{\chi}^{\pm}_1 \rightarrow W^{\pm}\widetilde{\chi}^0_1$, takes place with a branching ratio of 100%, see Fig. 11.

[35] KHACHATRYAN 15AD searched in 19.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two opposite-sign same flavor isolated leptons featuring either a kinematic edge, or a peak at the Z-boson mass, in the invariant mass spectrum. No evidence for a statistically significant excess over the expected SM backgrounds is observed and 95% C.L. exclusion limits are derived in a simplified model of sbottom pair production where the sbottom decays into a b-quark, two opposite-sign dileptons and a neutralino LSP, through an intermediate state containing either an off-shell Z-boson or a slepton, see Fig. 8.

[36] AAD 14AX searched in 20.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for the strong production of supersymmetric particles in events containing either zero or at last one high high-p_T lepton, large missing transverse momentum, high jet multiplicity and at least three jets identified as originating from b-quarks. No excess over the expected SM background is observed. Limits are derived in mSUGRA/CMSSM models with tanβ = 30, A_0 = $-2\ m_0$ and μ > 0, see their Fig. 14. Also, exclusion limits are set in simplified models containing scalar bottom quarks, where the decay $\widetilde{b} \rightarrow b\widetilde{\chi}^0_2$ and $\widetilde{\chi}^0_2 \rightarrow h\widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, see their Figures 11.

[37] AAD 14E searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for strongly produced supersymmetric particles in events containing jets and two same-sign leptons or three leptons. The search also utilises jets originating from b-quarks, missing transverse momentum and other variables. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing bottom, see Fig. 7. Limits are also derived in the mSUGRA/CMSSM, bRPV and GMSB models, see their Fig. 8.

[38] CHATRCHYAN 14H searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in a simplified models where the decay $\widetilde{b} \rightarrow t\widetilde{\chi}^{\pm}_1$, $\widetilde{\chi}^{\pm}_1 \rightarrow W^{\pm}\widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, with varying mass of the $\widetilde{\chi}^{\pm}_1$, for $m_{\widetilde{\chi}^0_1}$ = 50 GeV, see Fig. 6.

[39] AAD 13AU searched in 20.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing two jets identified as originating from b-quarks and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks. Assuming that the decay $\widetilde{b}_1 \rightarrow b\widetilde{\chi}^0_1$ takes place 100% of the time, a $\widetilde{b}_1$ mass below 620 GeV is excluded for $m_{\widetilde{\chi}^0_1}$ < 120 GeV. For more details, see their Fig. 5.

[40] CHATRCHYAN 13AT provides interpretations of various searches for supersymmetry by the CMS experiment based on 4.73–4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV in the framework of simplified models. Limits are set on the sbottom mass in a simplified models where sbottom quarks are pair-produced and the decay $\widetilde{b} \rightarrow b\widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, see Fig. 4.

[41] CHATRCHYAN 13T searched in 11.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the α_T variable to discriminate between processes with genuine and misreconstructed $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{b} \rightarrow b\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 8 and Table 9.

[42] CHATRCHYAN 13V searched in 10.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with two isolated same-sign dileptons and at least two b-jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the bottom mass in a simplified models where the decay $\widetilde{b} \rightarrow t\widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow W^\pm\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, with varying mass of the $\widetilde{\chi}_1^\pm$, for $m_{\widetilde{\chi}_1^0}$ = 50 GeV, see Fig. 4.

[43] AAD 12AN searched in 2.05 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for scalar bottom quarks in events with large missing transverse momentum and two b-jets in the final state. The data are found to be consistent with the Standard Model expectations. Limits are set in an R-parity conserving minimal supersymmetric scenario, assuming B($\widetilde{b}_1 \rightarrow b\widetilde{\chi}_1^0$) = 100%, see their Fig. 2.

[44] CHATRCHYAN 12AI looked in 4.98 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with two same-sign leptons (e, μ), but not necessarily same flavor, at least 2 b-jets and missing transverse energy. No excess beyond the Standard Model expectation is observed. Exclusion limits are derived in a simplified model for sbottom pair production, where the sbottom decays through $\widetilde{b}_1 \rightarrow t\widetilde{\chi}_1 W$, see Fig. 8.

[45] CHATRCHYAN 12BO searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for scalar bottom quarks in events with large missing transverse momentum and two b-jets in the final state. The data are found to be consistent with the Standard Model expectations. Limits are set in an R-parity conserving minimal supersymmetric scenario, assuming B($\widetilde{b}_1 \rightarrow b\widetilde{\chi}_1^0$) = 100%, see their Fig. 2.

[46] AAD 11K looked in 34 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or time of flight in the tile calorimeter, from pair production of $\widetilde{b}$. No evidence for an excess over the SM expectation is observed and limits on the mass are derived for pair production of sbottom, see Fig. 4.

[47] AAD 11O looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with jets, of which at least one is a b-jet, and $\not{E}_T$. No excess above the Standard Model was found. Limits are derived in the ($m_{\widetilde{g}}$, $m_{\widetilde{b}_1}$) plane (see Fig. 2) under the assumption of 100% branching ratios and $\widetilde{b}_1$ being the lightest squark. The quoted limit is valid for $m_{\widetilde{b}_1} <$ 500 GeV. A similar approach for $\widetilde{t}_1$ as the lightest squark with $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow b\widetilde{\chi}_1^\pm$ with 100% branching ratios leads to a gluino mass limit of 520 GeV for 130 $< m_{\widetilde{t}_1} <$ 300 GeV. Limits are also derived in the CMSSM (m_0, $m_{1/2}$) plane for tanβ = 40, see Fig. 4, and in scenarios based on the gauge group SO(10).

[48] CHATRCHYAN 11D looked in 35 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with $\geq$ 2 jets, at least one of which is b-tagged, and $\not{E}_T$, where the b-jets are decay products of $\widetilde{t}$ or $\widetilde{b}$. No evidence for an excess over the expected background is observed. Limits are derived in the CMSSM (m_0, $m_{1/2}$) plane for tanβ = 50 (see Fig. 2).

[49] AALTONEN 10R searched in 2.65 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s} = 1.96$ TeV for events with $\not{E}_T$ and exactly two jets, at least one of which is b-tagged. The results are in agreement with the SM prediction, and a limit on the cross section of 0.1 pb is obtained for the range of masses 80 $< m_{\widetilde{b}_1} <$ 280 GeV assuming that the sbottom decays exclusively to $b\widetilde{\chi}_1^0$. The excluded mass region in the framework of conserved R_p is shown in a plane of ($m_{\widetilde{b}_1}$, $m_{\widetilde{\chi}_1^0}$), see their Fig.2.

[50] ABAZOV 10L looked in 5.2 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}$ = 1.96 TeV for events with at least 2 b-jets and $\not{E}_T$ from the production of $\widetilde{b}_1 \widetilde{b}_1$. No evidence for an excess over the SM expectation is observed, and a limit on the cross section is derived under the assumption of 100% branching ratio. The excluded mass region in the framework of conserved R_p is shown in a plane of ($m_{\widetilde{b}_1}$,$m_{\widetilde{\chi}_1^0}$), see their Fig. 3b. The exclusion also extends to $m_{\widetilde{\chi}_1^0}$ = 110 GeV for 160< $m_{\widetilde{b}_1}$ < 200 GeV.

R-parity violating $\widetilde{b}$ (Sbottom) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>307	95	[1] KHACHATRY...	16BX	CMS	RPV, $\widetilde{b} \rightarrow t d$ or $t s$, λ''_{332} or λ''_{331} coupling
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[2] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{b}_1 \rightarrow t\widetilde{\chi}_1^{\pm}$ with $\widetilde{\chi}_1^{\pm} \rightarrow W^{(*)\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}} = 2\ m_{\widetilde{\chi}_1^0}$

[1] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing 2 leptons coming from R-parity-violating decays of supersymmetric particles. No excess over the expected background is observed. Limits are derived on the sbottom mass, assuming the RPV $\widetilde{b} \rightarrow t d$ or $\widetilde{b} \rightarrow t s$ decay, see Fig. 15.

[2] AAD 14E searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for strongly produced supersymmetric particles in events containing jets and two same-sign leptons or three leptons. The search also utilises jets originating from b-quarks, missing transverse momentum and other variables. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing bottom, see Fig. 7. Limits are also derived in the mSUGRA/CMSSM, bRPV and GMSB models, see their Fig. 8.

$\widetilde{t}$ (Stop) mass limit

Limits depend on the decay mode. In e^+e^- collisions they also depend on the mixing angle of the mass eigenstate $\widetilde{t}_1 = \widetilde{t}_L \cos\theta_t + \widetilde{t}_R \sin\theta_t$. The coupling to the Z vanishes when θ_t = 0.98. In the Listings below, we use $\Delta m \equiv m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ or $\Delta m \equiv m_{\widetilde{t}_1} - m_{\widetilde{\nu}}$, depending on relevant decay mode. See also bounds in "$\widetilde{q}$ (Squark) MASS LIMIT."

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

R-parity conserving $\widetilde{t}$ (Stop) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
none 200–920	95	[1] SIRUNYAN	21B	CMS	$\ell^{\pm}\ell^{\mp}$ + b-jets + $\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
none 250–810		[1] SIRUNYAN	21B	CMS	$\ell^{\pm}\ell^{\mp}$ + b-jets + $\not{E}_T$, Tstop2, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV

>1300	95	[1] SIRUNYAN	21B	CMS	$\ell^{\pm}\ell^{\mp}$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{l}} = (m_{\widetilde{\chi}_1^{\pm}}$- $m_{\widetilde{\chi}_1^0})/2 + m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0} = 0$
none 400–1180	95	[1] SIRUNYAN	21B	CMS	$\ell^{\pm}\ell^{\mp}$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{l}} = 0.05\ (m_{\widetilde{\chi}_1^{\pm}}$- $m_{\widetilde{\chi}_1^0}) + m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0}$ =0
>1400	95	[1] SIRUNYAN	21B	CMS	$\ell^{\pm}\ell^{\mp}$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{l}} = 0.95\ (m_{\widetilde{\chi}_1^{\pm}}$- $m_{\widetilde{\chi}_1^0}) + m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0}$ =0
none, 170–230	95	[2] AABOUD	20	ATLS	$e^{\pm}\mu^{\mp}$ + $\geq$ 1b-jet, Tstop1, $m_{\widetilde{\chi}_1^0}$ = 0.5 GeV
none, 170–220	95	[2] AABOUD	20	ATLS	$e^{\pm}\mu^{\mp}$ + $\geq$ 1b-jet, Tstop1, $m_{\widetilde{\chi}_1^0}$ < 62 GeV
>1220	95	[3] AAD	20AS	ATLS	$\ell^{\pm}\ell^{\mp}$ or 2 b-jets and $\not{E}_T$, Tstop6, $m_{\widetilde{\chi}_2^0}$=900 GeV
> 860	95	[4] AAD	20AS	ATLS	$\ell^{\pm}\ell^{\mp}$ or 2 b-jets and $\not{E}_T$, $\widetilde{t}_2$ with $\widetilde{t}_2 \to \widetilde{t}_1 Z$, $\widetilde{t}_1 \to b f f' \widetilde{\chi}_1^0$, Δm($\widetilde{t}_1$, $\widetilde{\chi}_1^0$) = 40 GeV
none 400–1250	95	[5] AAD	20S	ATLS	jets+$\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0}$=0 GeV
none 300–660	95	[6] AAD	20S	ATLS	jets+$\not{E}_T$, Tstop3, $m_{\widetilde{\chi}_1^0}$=0 GeV
> 765	95	[7] AAD	20V	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets, $\widetilde{t}_1 \to t\widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \to \widetilde{\chi}_1^{\pm} W$, $\widetilde{\chi}_1^{\pm} \to \widetilde{\chi}_1^0 W$, $m_{\widetilde{\chi}_1^{\pm}} \sim m_{\widetilde{\chi}_1^0}$
>1200	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1175	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0}$ < 425 GeV
none 230–1140	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop2, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1100	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop2, $m_{\widetilde{\chi}_1^{\pm}} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, 50 < $m_{\widetilde{\chi}_1^0}$ < 425 GeV
>1070	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop8, $m_{\widetilde{\chi}_1^{\pm}} - m_{\widetilde{\chi}_1^0}$ = 5 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV

>1050	95	[8] SIRUNYAN	20AH	CMS	$\ell^{\pm}$ + jet + $\not{E}_T$, Tstop8, $m_{\widetilde{\chi}_1^{\pm}} - m_{\widetilde{\chi}_1^0} = 5$ GeV, $m_{\widetilde{\chi}_1^0} < 350$ GeV
>730	95	[9] SIRUNYAN	20T	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ or $\geq 3\ell^{\pm}$ + jets, Tstop7, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} =$ 175 GeV, $m_{\widetilde{t}_1} = 200$ GeV, B($\widetilde{t}_2 \to \widetilde{t}_1 H$) = 100%
>890	95	[9] SIRUNYAN	20T	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ or $\geq 3\ell^{\pm}$ + jets, Tstop7, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} =$ 175 GeV, $m_{\widetilde{t}_1} = 200$ GeV, B($\widetilde{t}_2 \to \widetilde{t}_1 Z$) = 100%
>760	95	[9] SIRUNYAN	20T	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ or $\geq 3\ell^{\pm}$ + jets, Tstop7, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} =$ 175 GeV, $m_{\widetilde{t}_1} = 200$ GeV, B($\widetilde{t}_2 \to \widetilde{t}_1 Z$) = B($\widetilde{t}_2 \to \widetilde{t}_1 H$) = 50%
>1100	95	[10] SIRUNYAN	20U	CMS	$\tau^{\pm}\tau^{\mp}$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^{\pm}} = 0.5$ ($m_{\widetilde{t}}$ + $m_{\widetilde{\chi}_1^0}$), $m_{\widetilde{\tau}} = 0.5\ m_{\widetilde{\chi}_1^{\pm}}$, $m_{\widetilde{\chi}_1^0} = 0$
>1110	95	[11] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not{E}_T$, Tstop13, $m_{\widetilde{\chi}_1^0} = 1$ GeV
>1230	95	[11] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not{E}_T$, Tstop13, $m_{\widetilde{\chi}_1^0} = 800$ GeV
>1190	95	[12] SIRUNYAN	19CH	CMS	jets+$\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0}$= 0 GeV
>1140	95	[13] SIRUNYAN	19S	CMS	1 or 2 ℓ + jets + $\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0} < 200$ GeV
>208	95	[14] SIRUNYAN	19U	CMS	$e^{\pm}\mu^{\mp}$ + $\geq 1b$-jet, Tstop1, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 175 GeV
>235	95	[14] SIRUNYAN	19U	CMS	$e^{\pm}\mu^{\mp}$ + $\geq 1b$-jet, Tstop1, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 182.5 GeV
>242	95	[14] SIRUNYAN	19U	CMS	$e^{\pm}\mu^{\mp}$ + $\geq 1b$-jet, Tstop1, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 167.5 GeV
>940	95	[15] AABOUD	18AQ	ATLS	1ℓ+jets+$\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>270	95	[16] AABOUD	18AQ	ATLS	1ℓ+jets+$\not{E}_T$, Tstop3, $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0} = 20$ GeV
>840	95	[17] AABOUD	18AQ	ATLS	1ℓ+jets+$\not{E}_T$, Tstop2, $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^{\pm}} = 10$ GeV
>500	95	[18] AABOUD	18BV	ATLS	c-jets+$\not{E}_T$, Tstop4, $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0} < 100$ GeV

$>$ 850	95	[19] AABOUD	18BV	ATLS	c-jets+$\not\!\!E_T$, Tstop4, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
$>$ 390	95	[20] AABOUD	18I	ATLS	$\geq$ 1 jets+$\not\!\!E_T$, Tstop3, $m_{\widetilde{t}} \sim m_{\widetilde{\chi}^0_1}$
$>$ 430	95	[21] AABOUD	18I	ATLS	$\geq$ 1 jets+$\not\!\!E_T$, Tstop4, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = 5 GeV
$>$1160	95	[22] AABOUD	18Y	ATLS	2ℓ ($\geq$ 1 hadronic τ) + b-jets + $\not\!\!E_T$, Tstop5, $m_{\widetilde{\tau}} \sim$ 800 GeV
$>$ 450	95	[23] SIRUNYAN	18AJ	CMS	2ℓ (soft) + $\not\!\!E_T$, Tstop10, $m_{\widetilde{\chi}^\pm_1} = (m_{\widetilde{t}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 40 GeV
$>$ 720	95	[24] SIRUNYAN	18AL	CMS	$\geq 3\ell^\pm$ + jets + $\not\!\!E_T$, Tstop7, $m_{\widetilde{t}_1}$ - $m_{\widetilde{\chi}^0_1}$ = 175 GeV, $m_{\widetilde{t}_1}$ = 200 GeV, BR($\widetilde{t}_2 \rightarrow \widetilde{t}_1 H$) = 100%
$>$ 780	95	[24] SIRUNYAN	18AL	CMS	$\geq 3\ell^\pm$ + jets + $\not\!\!E_T$, Tstop7, $m_{\widetilde{t}_1}$ - $m_{\widetilde{\chi}^0_1}$ = 175 GeV, $m_{\widetilde{t}_1}$ = 200 GeV, BR($\widetilde{t}_2 \rightarrow \widetilde{t}_1 Z$) = 100%
$>$ 710	95	[24] SIRUNYAN	18AL	CMS	$\geq 3\ell^\pm$ + jets + $\not\!\!E_T$, Tstop7, $m_{\widetilde{t}_1}$ - $m_{\widetilde{\chi}^0_1}$ = 175 GeV, $m_{\widetilde{t}_1}$ = 200 GeV, BR($\widetilde{t}_2 \rightarrow \widetilde{t}_1 Z$) = BR($\widetilde{t}_2 \rightarrow \widetilde{t}_1 H$) = 50%
$>$ 730	95	[25] SIRUNYAN	18AN	CMS	1 or 2 γ + ℓ + jets, GGM, Tstop12, $m_{\widetilde{\chi}^0_1}$ = 150 GeV
$>$ 650	95	[25] SIRUNYAN	18AN	CMS	1 or 2 γ + ℓ + jets, GGM, Tstop12, $m_{\widetilde{\chi}^0_1}$ = 500 GeV
$>$1000	95	[26] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}$=0 GeV
$>$ 500	95	[26] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$,Tstop4,$m_{\widetilde{\chi}^0_1}$=420 GeV
$>$ 510	95	[27] SIRUNYAN	18B	CMS	jets+$\not\!\!E_T$, Tstop4, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = 10 GeV
$>$ 800	95	[28] SIRUNYAN	18C	CMS	$\ell^\pm \ell^\mp$ + b-jets + $\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}$ = 0
$>$ 750	95	[28] SIRUNYAN	18C	CMS	$\ell^\pm \ell^\mp$ + b-jets + $\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1} = (m_{\widetilde{t}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ = 0
$>$1050	95	[28] SIRUNYAN	18C	CMS	Combination of all-hadronic, 1 $\ell^\pm$ and $\ell^\pm \ell^\mp$ searches, Tstop1, $m_{\widetilde{\chi}^0_1}$ = 0
$>$1000	95	[28] SIRUNYAN	18C	CMS	Combination of all-hadronic, 1 $\ell^\pm$ and $\ell^\pm \ell^\mp$ searches, Tstop2, $m_{\widetilde{\chi}^\pm_1} = (m_{\widetilde{t}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ = 0

>1200	95	[28] SIRUNYAN	18C	CMS	$\ell^\pm \ell^\mp$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^\pm} = 0.5\ (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})$, $m_{\widetilde{\ell}} = 0.5\ m_{\widetilde{\chi}_1^\pm}$, $m_{\widetilde{\chi}_1^0} = 0$
>1300	95	[28] SIRUNYAN	18C	CMS	$\ell^\pm \ell^\mp$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^\pm} = 0.5\ (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})$, $m_{\widetilde{\ell}} = 0.95\ m_{\widetilde{\chi}_1^\pm}$, $m_{\widetilde{\chi}_1^0} = 0$
none 460–1060	95	[28] SIRUNYAN	18C	CMS	$\ell^\pm \ell^\mp$ + b-jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_1^\pm} = 0.5\ (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})$, $m_{\widetilde{\ell}} = 0.05\ m_{\widetilde{\chi}_1^\pm}$, $m_{\widetilde{\chi}_1^0} = 0$
>1020	95	[29] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $\not{E}_T$, Tstop1, $m_{\widetilde{\chi}_1^0} = 0$ GeV
> 420	95	[30] SIRUNYAN	18DI	CMS	$\ell^\pm$ + jet + $\not{E}_T$, Tstop3, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 10$ GeV
> 560	95	[30] SIRUNYAN	18DI	CMS	$\ell^\pm$ + jet + $\not{E}_T$, Tstop3, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 80$ GeV
> 540	95	[30] SIRUNYAN	18DI	CMS	$\ell^\pm$, Tstop10, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 40$ GeV
> 590	95	[30] SIRUNYAN	18DI	CMS	Combination of all-hadronic and 1 $\ell^\pm$ searches, Tstop3, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 30$ GeV
> 670	95	[30] SIRUNYAN	18DI	CMS	Combination of all-hadronic and 1 $\ell^\pm$ searches, Tstop10, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 60$ GeV
> 450	95	[31] SIRUNYAN	18DN	CMS	$\ell^\pm \ell^\mp$, Tstop1, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = m_W$
none 225–325	95	[31] SIRUNYAN	18DN	CMS	$\ell^\pm \ell^\mp$, Tstop2, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0} = 2\ m_W$
none 210–690	95	[31] SIRUNYAN	18DN	CMS	$\ell^\pm \ell^\mp$, Tstop1, $m_{\widetilde{\chi}_1^0} = 0$ GeV
none 250–600	95	[31] SIRUNYAN	18DN	CMS	$\ell^\pm \ell^\mp$, Tstop2, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{t}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
> 700	95	[32] AABOUD	17AJ	ATLS	same-sign $\ell^\pm \ell^\pm$ / 3 ℓ + jets + $\not{E}_T$, Tstop11, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^0}$ + 100 GeV
> 880	95	[33] AABOUD	17AX	ATLS	b-jets+$\not{E}_T$, mixture Tstop1 and Tstop2 with BR=50%, $m_{\widetilde{\chi}_1^0}$ = 0 GeV, $m_{\widetilde{\chi}_1^\pm}$ - $m_{\widetilde{\chi}_1^0}$ = 1 GeV

none 250–1000	95	[34] AABOUD	17AY	ATLS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1} = 0$ GeV
none 450–850	95	[35] AABOUD	17AY	ATLS	jets+$\not\!\!E_T$, mixture of Tstop1 and Tstop2 with BR=50%, $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} = 1$ GeV
$>$ 720	95	[36] AABOUD	17BE	ATLS	$\ell^\pm\ell^\mp + \not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1} = 0$ GeV
$>$ 400	95	[37] AABOUD	17BE	ATLS	$\ell^\pm\ell^\mp + \not\!\!E_T$, Tstop3, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1} = 40$ GeV
$>$ 430	95	[38] AABOUD	17BE	ATLS	$\ell^\pm\ell^\mp + \not\!\!E_T$, Tstop1 (offshell t), $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1} \sim m_W$
$>$ 700	95	[39] AABOUD	17BE	ATLS	$\ell^\pm\ell^\mp + \not\!\!E_T$, Tstop2, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^\pm_1} = 10$ GeV, $m_{\widetilde{\chi}^0_1} = 0$ GeV
$>$ 750	95	[40] KHACHATRY...	17	CMS	jets+$\not\!\!E_T$,Tstop1,$m_{\widetilde{\chi}^0_1}$=100GeV
none 250–740	95	[41] KHACHATRY...	17AD	CMS	jets+b-jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1} = 0$ GeV
$>$ 610	95	[42] KHACHATRY...	17AD	CMS	jets+b-jets+$\not\!\!E_T$, mixture Tstop1 and Tstop2 with BR=50%, $m_{\widetilde{\chi}^0_1} = 60$ GeV
$>$ 590	95	[43] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tstop8, $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} = 5$ GeV, $m_{\widetilde{\chi}^0_1} = 100$ GeV
none 280–640	95	[43] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1} = 0$ GeV
$>$ 350	95	[43] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tstop4, 10 GeV $< m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1} < 80$ GeV
$>$ 280	95	[43] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tstop3, 10 GeV $< m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1} < 80$ GeV
$>$ 320	95	[43] KHACHATRY...	17P	CMS	1 or more jets+$\not\!\!E_T$, Tstop9, 10 GeV $< m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1} < 80$ GeV
$>$ 240	95	[44] KHACHATRY...	17S	CMS	jets+$\not\!\!E_T$, Tstop4, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1} =$ 10 GeV
$>$ 225	95	[45] KHACHATRY...	17S	CMS	jets+$\not\!\!E_T$, Tstop3, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1} =$ 10 GeV
$>$ 325	95	[46] KHACHATRY...	17S	CMS	jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1} = 0.25$ $m_{\widetilde{t}} + 0.75\ m_{\widetilde{\chi}^0_1}$, $m_{\widetilde{\chi}^0_1} = 225$ GeV
$>$ 400	95	[47] KHACHATRY...	17S	CMS	jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1} = 0.75$ $m_{\widetilde{t}} + 0.25\ m_{\widetilde{\chi}^0_1}$, $m_{\widetilde{\chi}^0_1} = 0$ GeV
$>$ 500	95	[48] KHACHATRY...	17S	CMS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1} = 0$ GeV

>1120	95	[49] SIRUNYAN	17AS	CMS	1ℓ+jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}=0$ GeV
>1000	95	[49] SIRUNYAN	17AS	CMS	1ℓ+jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1}=(m_{\widetilde{t}}+m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}=0$ GeV
>980	95	[49] SIRUNYAN	17AS	CMS	1ℓ+jets+$\not\!\!E_T$, Tstop8, $m_{\widetilde{\chi}^\pm_1}-m_{\widetilde{\chi}^0_1}=5$ GeV, $m_{\widetilde{\chi}^0_1}=0$ GeV
>1040	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}=0$ GeV
>750	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1}=(m_{\widetilde{t}}+m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}=0$ GeV
>940	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop8, $m_{\widetilde{\chi}^\pm_1}-m_{\widetilde{\chi}^0_1}=5$ GeV, $m_{\widetilde{\chi}^0_1}=100$ GeV
>540	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop3, 10 GeV $<m_{\widetilde{t}_1}-m_{\widetilde{\chi}^0_1}<80$ GeV
>480	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop4, 10 GeV $<m_{\widetilde{t}_1}-m_{\widetilde{\chi}^0_1}<80$ GeV
>530	95	[50] SIRUNYAN	17AT	CMS	jets+$\not\!\!E_T$, Tstop10, $m_{\widetilde{\chi}^\pm_1}=(m_{\widetilde{t}}+m_{\widetilde{\chi}^0_1})/2$, 10 GeV $<m_{\widetilde{t}_1}-m_{\widetilde{\chi}^0_1}<80$ GeV
>1070	95	[51] SIRUNYAN	17AZ	CMS	≥ 1 jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}=0$ GeV
>900	95	[51] SIRUNYAN	17AZ	CMS	≥ 1 jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^\pm_1}=(m_{\widetilde{t}}+m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}=0$ GeV
>1020	95	[51] SIRUNYAN	17AZ	CMS	$\geq$ 1jets+$\not\!\!E_T$, Tstop8, $m_{\widetilde{\chi}^\pm_1}-m_{\widetilde{\chi}^0_1}=5$ GeV, $m_{\widetilde{\chi}^0_1}=100$ GeV
>540	95	[51] SIRUNYAN	17AZ	CMS	≥ 1 jets+$\not\!\!E_T$, Tstop4, 10 GeV $<m_{\widetilde{t}_1}-m_{\widetilde{\chi}^0_1}<80$ GeV
none 280–830	95	[52] SIRUNYAN	17K	CMS	0, 1 $\ell^\pm$+jets+$\not\!\!E_T$ (combination), Tstop1, $m_{\widetilde{\chi}^0_1}=0$ GeV
>700	95	[52] SIRUNYAN	17K	CMS	0, 1 $\ell^\pm$+jets+$\not\!\!E_T$ (combination), Tstop8, $m_{\widetilde{\chi}^\pm_1}-m_{\widetilde{\chi}^0_1}=5$ GeV, $m_{\widetilde{\chi}^0_1}=100$ GeV
>160	95	[52] SIRUNYAN	17K	CMS	jets+$\not\!\!E_T$, Tstop4, 10 $<m_{\widetilde{t}}-m_{\widetilde{\chi}^0_1}<80$ GeV
none 230–960	95	[53] SIRUNYAN	17P	CMS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}=0$ GeV
>990	95	[53] SIRUNYAN	17P	CMS	jets+$\not\!\!E_T$, Tsbot1, $m_{\widetilde{\chi}^0_1}=0$ GeV

$>$ 323	95	[54] AABOUD	16D	ATLS	$\geq$ 1 jet + $\not\!\!E_T$, Tstop4, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 5 GeV
none, 745–780	95	[55] AABOUD	16J	ATLS	1 $\ell^{\pm}$ + $\geq$ 4 jets + $\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
$>$ 490–650	95	[56] AAD	16AY	ATLS	2ℓ (including hadronic τ) + $\not\!\!E_T$, Tstop5, 87 GeV$<$ $m_{\widetilde{\tau}}$ $<$ $m_{\widetilde{t}_1}$
$>$ 700	95	[57] KHACHATRY...	16AV	CMS	1 or 2 $\ell^{\pm}$+jets+b-jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}$ $<$ 250 GeV
$>$ 700	95	[57] KHACHATRY...	16AV	CMS	1 or 2 $\ell^{\pm}$+jets+b-jets $\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^0_1}$ = 0 GeV, $m_{\widetilde{\chi}^{\pm}_1}$ = 0.75 $m_{\widetilde{t}_1}$ + 0.25 $m_{\widetilde{\chi}^0_1}$
$>$ 775	95	[58] KHACHATRY...	16BK	CMS	jets+$\not\!\!E_T$,Tstop1,$m_{\widetilde{\chi}^0_1}$ $<$200GeV
$>$ 620	95	[58] KHACHATRY...	16BK	CMS	jets+$\not\!\!E_T$, Tstop2, $m_{\widetilde{\chi}^0_1}$=0 GeV
$>$ 800	95	[59] KHACHATRY...	16BS	CMS	jets+$\not\!\!E_T$, Tstop1, $m_{\widetilde{\chi}^0_1}$=0 GeV
$>$ 316	95	[60] KHACHATRY...	16Y	CMS	1 or 2 soft $\ell^{\pm}$ + jets + $\not\!\!E_T$, Tstop3,$m_{\widetilde{t}}-m_{\widetilde{\chi}^0_1}$=25 GeV
$>$ 250	95	[61] AAD	15CJ	ATLS	B($\widetilde{t} \rightarrow c\widetilde{\chi}^0_1$)+B($\widetilde{t} \rightarrow b f f' \widetilde{\chi}^0_1$) = 1, $m_{\widetilde{t}}-m_{\widetilde{\chi}^0_1}$ = 10 GeV
$>$ 270	95	[61] AAD	15CJ	ATLS	$\widetilde{t} \rightarrow c\widetilde{\chi}^0_1$, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$=80 GeV
none, 200–700	95	[61] AAD	15CJ	ATLS	$\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0
$>$ 500	95	[61] AAD	15CJ	ATLS	B($\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$) + B($\widetilde{t} \rightarrow b\widetilde{\chi}^{\pm}_1$) = 1, $\widetilde{\chi}^{\pm}_1 \rightarrow W^{(*)}\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^{\pm}_1}$ = 2$m_{\widetilde{\chi}^0_1}$, $m_{\widetilde{\chi}^0_1}$ $<$ 160 GeV
$>$ 600	95	[61] AAD	15CJ	ATLS	$\widetilde{t}_2 \rightarrow Z\widetilde{t}_1$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 180 GeV, $m_{\widetilde{\chi}^0_1}$ = 0
$>$ 600	95	[61] AAD	15CJ	ATLS	$\widetilde{t}_2 \rightarrow h\widetilde{t}_1$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 180 GeV, $m_{\widetilde{\chi}^0_1}$ = 0
none, 172.5–191	95	[62] AAD	15J	ATLS	$\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
$>$ 450	95	[63] KHACHATRY...	15AF	CMS	$\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0, $m_{\widetilde{t}}$ $>$ m_t + $m_{\widetilde{\chi}^0_1}$
$>$ 560	95	[64] KHACHATRY...	15AH	CMS	$\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 0, $m_{\widetilde{t}}$ $>$ m_t + $m_{\widetilde{\chi}^0_1}$
$>$ 250	95	[65] KHACHATRY...	15AH	CMS	$\widetilde{t} \rightarrow c\widetilde{\chi}^0_1$, $m_{\widetilde{t}}-m_{\widetilde{\chi}^0_1}$ $<$10 GeV
none, 200–350	95	[66] KHACHATRY...	15L	CMS	$\widetilde{t} \rightarrow q q$, RPV, $\lambda''_{312} \neq 0$
none, 200–385	95	[66] KHACHATRY...	15L	CMS	$\widetilde{t} \rightarrow q b$, RPV, $\lambda''_{323} \neq 0$
$>$ 730	95	[67] KHACHATRY...	15X	CMS	$\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 100 GeV, $m_{\widetilde{t}}$ $>$ m_t + $m_{\widetilde{\chi}^0_1}$

none 400–645	95	[67] KHACHATRY...	15X	CMS	$\widetilde{t} \to t\widetilde{\chi}_1^0$ or $\widetilde{t} \to b\widetilde{\chi}_1^\pm$, $m_{\widetilde{\chi}_1^0}$ = 100 GeV, $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}$ = 5 GeV
none 270–645	95	[68] AAD	14AJ	ATLS	$\geq$ 4 jets + $\not\!\!E_T$, $\widetilde{t}_1 \to t\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ < 30 GeV
none 250–550	95	[68] AAD	14AJ	ATLS	$\geq$ 4 jets + $\not\!\!E_T$, B($\widetilde{t}_1 \to b\widetilde{\chi}_1^\pm$) = 50 %, $m_{\widetilde{\chi}_1^\pm}$ = 2 $m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0}$ < 60 GeV
none 210–640	95	[69] AAD	14BD	ATLS	$\ell^\pm$ + jets + $\not\!\!E_T$, $\widetilde{t}_1 \to t\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
> 500	95	[69] AAD	14BD	ATLS	$\ell^\pm$ + jets + $\not\!\!E_T$, $\widetilde{t}_1 \to b\widetilde{\chi}_1^\pm$, $m_{\widetilde{\chi}_1^\pm}$ = 2 $m_{\widetilde{\chi}_1^0}$, 100 GeV < $m_{\widetilde{\chi}_1^0}$ < 150 GeV
none 150–445	95	[70] AAD	14F	ATLS	$\ell^\pm\ell^\mp$ final state, $\widetilde{t}_1 \to b\widetilde{\chi}_1^\pm$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^\pm}$ = 10 GeV, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
none 215–530	95	[70] AAD	14F	ATLS	$\ell^\pm\ell^\mp$ final state, $\widetilde{t}_1 \to t\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
> 270	95	[71] AAD	14T	ATLS	$\widetilde{t}_1 \to c\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 200 GeV
> 240	95	[71] AAD	14T	ATLS	$\widetilde{t}_1 \to c\widetilde{\chi}_1^0$,$m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ <85 GeV
> 255	95	[71] AAD	14T	ATLS	$\widetilde{t}_1 \to bff'\widetilde{\chi}_1^0$, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} \approx m_b$
> 400	95	[72] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\widetilde{t} \to t\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
		[73] CHATRCHYAN	14R	CMS	$\geq 3\ell^\pm$, $\widetilde{t} \to (b\widetilde{\chi}_1^\pm / t\widetilde{\chi}_1^0)$, $\widetilde{\chi}_1^\pm \to (qq'/\ell\nu)\widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \to (H/Z)\widetilde{G}$, GMSB, natural higgsino NLSP scenario
> 740	95	[74] KHACHATRY...	14T	CMS	τ + b-jets, RPV, $LQ\overline{D}$, $\lambda'_{333} \neq$ 0, $\widetilde{t} \to \tau b$ simplified model
> 580	95	[74] KHACHATRY...	14T	CMS	τ + b-jets, RPV, $LQ\overline{D}$, $\lambda'_{3jk} \neq$ 0 ($j \neq$ =3), $\widetilde{t} \to \widetilde{\chi}^\pm b$, $\widetilde{\chi}^\pm \to qq\tau^\pm$ simplified model

• • • We do not use the following data for averages, fits, limits, etc. • • •

> 850	95	[75] AABOUD	17AF	ATLS	2ℓ+jets+b-jets+$\not\!\!E_T$, Tstop6, $m_{\widetilde{\chi}_1^0}$ = 0
> 800	95	[76] AABOUD	17AF	ATLS	2ℓ+jets+b-jets+$\not\!\!E_T$, Tstop7 with 100% decays via Z, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
> 880	95	[77] AABOUD	17AF	ATLS	2ℓ+jets+b-jets+$\not\!\!E_T$, Tstop7 with 100% decays via higgs, $m_{\widetilde{\chi}_1^0}$ = 50 GeV

		[78] AABOUD	17AY	ATLS	jets+$\not{E}_T$, pMSSM-inspired
$>$ 230		ROLBIECKI	15	THEO	WW xsection, $\widetilde{t}_1 \rightarrow bW\widetilde{\chi}^0_1$, $m_{\widetilde{t}_1} \simeq m_b + m_W + m_{\widetilde{\chi}^0_1}$
$>$ 600	95	[79] AAD	14B	ATLS	Z+b $\not{E}_T$, $\widetilde{t}_2 \rightarrow Z\widetilde{t}_1$, $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1} < 200$ GeV
$>$ 540	95	[79] AAD	14B	ATLS	Z+b $\not{E}_T$, $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \rightarrow Z\widetilde{G}$, natural GMSB, 100 GeV $< m_{\widetilde{\chi}^0_1} < m_{\widetilde{t}_1}$ −10 GeV
$>$ 360	95	[80] CHATRCHYAN	14U	CMS	$\widetilde{t}_1 \rightarrow b\widetilde{\chi}^{\pm}_1$r, $\widetilde{\chi}^{\pm}_1 \rightarrow ff'\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \rightarrow H\widetilde{G}$ simplified model, $m_{\widetilde{\chi}^{\pm}_1} - m_{\widetilde{\chi}^0_1} = 5$ GeV,GMSB
$>$ 215	95	CZAKON	14		$\widetilde{t} \rightarrow t\chi^0_1$, $m_{\chi^0_1} < 10$ GeV
		[81] KHACHATRY...	14C	CMS	$\widetilde{t}_2 \rightarrow H\widetilde{t}_1$ or $\widetilde{t}_2 \rightarrow Z\widetilde{t}_1$ simplified model

[1] SIRUNYAN 21B searched in 137 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for the pair production of top squarks in events with two oppositely charged leptons (electrons or muons), jets identified as originating from a b-quark and significant $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop2 and Tstop11 simplified models, see their Figures 6 and 7.

[2] AABOUD 20 searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing one electron-muon pair with opposite charge. The search targets a region of parameter space where the kinematics of top squark pair production and top quark pair production is very similar and makes use of the double-differential angular distributions of the leptons. No excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 model, see Figures 16 and 17.

[3] AAD 20AS searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for evidence of top squarks in events containing either a pair of jets consistent with SM Higgs boson decay into b-quarks or a same-flavour opposite-sign dilepton pair with an invariant mass consistent with a Z boson. No significant excess over the expected background is observed. Limits at 95% C.L. are set in Tstop6 simplified model. Assuming $m_{\widetilde{\chi}^0_1} = 0$ GeV, $\widetilde{t}_1$ masses up to 1220 GeV are excluded for $m_{\widetilde{\chi}^0_2}$ around 900 GeV. Limits reduce down to $\widetilde{t}_1$ masses up to 900 GeV for $m_{\widetilde{\chi}^0_2}$=130 GeV. See their Fig. 10. Limits are presented also in case of B($\widetilde{\chi}^0_2 \rightarrow \widetilde{\chi}^0_1 h$) = 0 and 1, see their Fig. 11.

[4] AAD 20AS searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for evidence of top squarks in events containing either a pair of jets consistent with SM Higgs boson decay into b-quarks or a same-flavour opposite-sign dilepton pair with an invariant mass consistent with a Z boson. No significant excess over the expected background is observed. Limits at 95% C.L. are set in simplified model featuring $\widetilde{t}_2$ pair production, $\widetilde{t}_2 \rightarrow \widetilde{t}_1 Z$ and $\widetilde{t}_1 \rightarrow bff'\widetilde{\chi}^0_1$. Assuming $m_{\widetilde{\chi}^0_1} = 300$ GeV, and a mass difference between $\widetilde{t}_1$ and $\widetilde{\chi}^0_1$ of 40 GeV, $\widetilde{t}_2$ masses up to 860 GeV are excluded. See their Fig. 12.

[5] AAD 20S searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on top squark masses in the Tstop1 model up to 1250 GeV for lightest neutralino masses below 200 GeV. Additional constraints are set in the case where $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1} \sim m_t$ for which top squark masses in the range 300–630 GeV are excluded. See their Fig. 13.

[6] AAD 20S searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on top squark masses in the Tstop3 model in the range 300–660 GeV. In case $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1} \sim$ 5 GeV or above, $m_{\widetilde{t}}$ below 500 GeV are excluded. See their Fig. 13(b).

[7] AAD 20V searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two same-sign charged leptons (electrons or muons) and jets. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on the top squark mass up to 765 GeV assuming $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_2$ with $\widetilde{\chi}^0_2 \rightarrow \widetilde{\chi}^\pm_1 W$ and $\widetilde{\chi}^\pm_1 \rightarrow \widetilde{\chi}^0_1 W$. Masses of the charginos and lightest neutralinos are set as $m_{\widetilde{\chi}^0_1} = m_{\widetilde{t}_1} - 275$ GeV, $m_{\widetilde{\chi}^0_2} = m_{\widetilde{\chi}^0_1} + 100$ GeV and $m_{\widetilde{\chi}^\pm_1} \sim m_{\widetilde{\chi}^0_1}$. See their Fig. 8(b).

[8] SIRUNYAN 20AH searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for pair production of top squarks in events with a single isolated electron or muon, multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop2 and Tstop8 simplified models, see Figures 6, 7 and 8, respectively.

[9] SIRUNYAN 20T searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least two jets, and two isolated same-sign or three or more charged leptons (electrons or muons). No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figure 7, and in the Tglu1C and Tglu1B simplified models, see their Figures 8 and 9. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 10, and on the stop mass in the Tstop7 simplified model, see their Figure 11. Finally, limits are set on the gluino mass in RPV simplified models where the gluino decays either via $\widetilde{g} \rightarrow q q \overline{q} \overline{q} + e/\mu/\tau$ or via $\widetilde{g} \rightarrow t b s$, see Figure 12.

[10] SIRUNYAN 20U searched in 77.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for the pair production of top squarks in events with two hadronically decaying taus, jets identified as originating from a b-quark and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop11 simplified model assuming the final state leptons are taus. Different values of the scalar tau mass are considered; the impact on the lower bound is negligible.

[11] SIRUNYAN 19AU searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at last one photon, jets, some of which are identified as originating from b-quarks, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the gluino mass in the Tglu4C, Tglu4D and Tglu4E simplified models, and on the top squark mass in the Tstop13 simplified model, see their Figure 5.

[12] SIRUNYAN 19CH searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A and Tglu3A simplified models, see their Figure 13. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 simplified models, see their Figure 14.

[13] SIRUNYAN 19S searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with zero or one charged leptons, jets and $\not{E}_T$. The razor variables (M_R and R^2) are used to categorize the events. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu3C simplified models, see Figures 22 and 23, and on the stop mass in the Tstop1 simplified model, see their Figure 24.

[14] SIRUNYAN 19U searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing one electron-muon pair with opposite charge. The search targets a region of parameter space where the kinematics of top squark pair production and top quark pair production is very similar, due to the mass difference between the top squark and the neutralino being close to the top quark mass. No excess above the Standard Model

expectations is observed. Limits are set on the stop mass in the Tstop1 model, with $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ close to m_t, see Figure 5.

[15] AABOUD 18AQ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for top squark pair production in final states with one isolated electron or muon, several energetic jets, and missing transverse momentum. No significant excess over the Standard Model prediction is observed. In case of Tstop1 models, top squark masses up to 940 GeV are excluded assuming $m_{\widetilde{\chi}_1^0} = 0$ GeV, see their Fig. 20. If the top quark is not on-shell (3-body) decay, exclusions up to 500 GeV are obtained for $m_{\widetilde{\chi}_1^0} = 300$ GeV. Exclusions as a function of $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ are given in their Fig. 21.

[16] AABOUD 18AQ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for top squark pair production in final states with one isolated electron or muon, several energetic jets, and missing transverse momentum. No significant excess over the Standard Model prediction is observed. In case of Tstop3 models (4-body), top squark masses up to 370 GeV are excluded for $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0}$ as low as 20 GeV. Top squark masses below 195 GeV are excluded for all $m_{\widetilde{\chi}_1^0}$, see their Fig. 20 and Fig. 21.

[17] AABOUD 18AQ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for top squark pair production in final states with one isolated electron or muon, several energetic jets, and missing transverse momentum. No significant excess over the Standard Model prediction is observed. In case of Tstop2 models, top squark masses up to 840 GeV are excluded for $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^\pm} = 10$ GeV. See their Fig. 23. Exclusion limits for this decay mode are presented also in the context of Higgsino-LSP phenomenological MSSM models, where $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0} = 5$ GeV, see their Fig 26.

[18] AABOUD 18BV searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one jet identified as c-jet, large missing transverse energy and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tstop4 models. In scenarios with differences of the stop and neutralino masses below 100 GeV, stop masses below 500 GeV are excluded. See their Fig.6 and Fig.7.

[19] AABOUD 18BV searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one jet identified as c-jet, large missing transverse energy and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tstop1 models. In scenarios with massless neutralinos, top squark masses below 850 GeV are excluded. See their Fig.6.

[20] AABOUD 18I searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one jet with a transverse momentum above 250 GeV and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tstop3 models. Stop masses below 390 GeV are excluded for $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0} = m_b$. See their Fig.9(b).

[21] AABOUD 18I searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least one jet with a transverse momentum above 250 GeV and no leptons. Good agreement is observed between the number of events in data and Standard Model predictions. The results are translated into exclusion limits in Tstop4 models. In scenarios with differences of the stop and neutralino masses around 5 GeV, stop masses below 430 GeV are excluded. See their Fig.9(a).

[22] AABOUD 18Y searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for direct pair production of top squarks in final states with two tau leptons, b-jets, and missing transverse momentum. At least one hadronic τ is required. No significant deviation from the SM predictions is observed in the data. The analysis results are interpreted in Tstop5 models with a nearly massless gravitino. Top squark masses up to 1.16 TeV and tau slepton masses up to 1 TeV are excluded, see their Fig 7.

[23] SIRUNYAN 18AJ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two low-momentum, oppositely charged leptons (electrons or muons) and $E\!\!\!/_T$. No excess over the expected background is observed. Limits are derived on the wino mass in the Tchi1n2F simplified model, see their Figure 5. Limits are also set on the stop mass in the Tstop10 simplified model, see their Figure 6. Finally, limits are set on the Higgsino mass in the Tchi1n2G simplified model, see Figure 8 and in the pMSSM, see Figure 7.

[24] SIRUNYAN 18AL searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least three charged leptons, in any combination of electrons and muons, jets and significant $E\!\!\!/_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1C simplified models, see their Figure 5. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 6, and on the stop mass in the Tstop7 simplified model, see their Figure 7.

[25] SIRUNYAN 18AN searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing one or two photons and a pair of top quarks from the decay of a pair of top squark in a natural gauge-mediated scenario. The final state consists of a lepton (electron or muon), jets and one or two photons. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop12 simplified model, see their Figure 6.

[26] SIRUNYAN 18AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing one or more jets and significant $E\!\!\!/_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see their Figure 3. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 and Tstop4 simplified models, see their Figure 3. Finally, limits are set on long-lived gluino masses in a Tglu1A simplified model where the gluino is metastable or long-lived with proper decay lengths in the range 10^{-3} mm $< c\tau < 10^5$ mm, see their Figure 4.

[27] SIRUNYAN 18B searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for the pair production of third-generation squarks in events with jets and large $E\!\!\!/_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the sbottom mass in the Tsbot1 simplified model, see their Figure 5, and on the stop mass in the Tstop4 simplified model, see their Figure 6.

[28] SIRUNYAN 18C searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for the pair production of top squarks in events with two oppositely charged leptons (electrons or muons), jets identified as originating from a b-quark and large $E\!\!\!/_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop2 and Tstop11 simplified models, see their Figures 11 and 12. The Tstop1 and Tstop2 results are combined with complementary searches in the all-hadronic and single lepton channels, see their Figures 13 and 14.

[29] SIRUNYAN 18D searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing identified hadronically decaying top quarks, no leptons, and $E\!\!\!/_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 simplified model, see their Figure 8, and on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3E simplified models, see their Figure 9.

[30] SIRUNYAN 18DI searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for pair production of top squarks in events with a low transverse momentum lepton (electron or muon), a high-momentum jet and significant missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop3 and Tstop10 simplified models, see their Figures 7 and 8. A combination of this search with the all-hadronic search is presented in Figure 9.

[31] SIRUNYAN 18DN searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct electroweak production of charginos and for pair production of top squarks in events with two leptons (electrons or muons) of the opposite electric charge. No significant excess above the Standard Model expectations is observed. Limits are set on the chargino mass in the Tchi1chi1C and Tchi1chi1E simplified models, see their Figure 8. Limits are also set on the stop mass in the Tstop1 and Tstop2 simplified models, see their Figure 9.

[32] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 700 GeV are set on the top squark mass in Tstop11 simplified models, assuming $m_{\widetilde{\chi}_1^0} = m_{\widetilde{t}} - 275$ GeV and $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^0} + 100$ GeV. See their Figure 4(e).

[33] AABOUD 17AX searched in 36 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing two jets identified as originating from b-quarks and large missing transverse momentum, with or without leptons. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of top squarks. Assuming 50% BR for Tstop1 and Tstop2 simplified models, a $\widetilde{t}_1$ mass below 880 (860) GeV is excluded for $m_{\widetilde{\chi}_1^0} = 0$ (<250) GeV. See their Fig. 7(b).

[34] AABOUD 17AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least four jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits in the range 250–1000 GeV are set on the top squark mass in Tstop1 simplified models. For the first time, additional constraints are set for the region $m_{\widetilde{t}_1} \sim m_t + m_{\widetilde{\chi}_1^0}$, with exclusion of the $\widetilde{t}_1$ mass range 235–590 GeV. See their Figure 8.

[35] AABOUD 17AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least four jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits in the range 450-850 GeV are set on the top squark mass in a mixture of Tstop1 and Tstop2 simplified models with BR=50% and assuming $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0} = 1$ GeV and $m_{\chi_1^0} < 240$ GeV. Constraints are given for various values of the BR. See their Figure 9.

[36] AABOUD 17BE searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two opposite-charge leptons (electrons and muons) and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 720 GeV are set on the top squark mass in Tstop1 simplified models, assuming massless neutralinos. See their Figure 9 (2-body area).

[37] AABOUD 17BE searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two opposite-charge leptons (electrons and muons) and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 400 GeV are set on the top squark mass in Tstop3 simplified models, assuming $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 40$ GeV. See their Figure 9 (4-body area).

[38] AABOUD 17BE searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two opposite-charge leptons (electrons and muons) and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 430 GeV are set on the top squark mass in Tstop1 simplified models where top quarks are offshell, assuming $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ close to the W mass. See their Figure 9 (3-body area).

[39] AABOUD 17BE searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two opposite-charge leptons (electrons and muons) and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 700 GeV are set on the top squark mass in Tstop2 simplified models, assuming $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^\pm} = 10$ GeV and massless neutralinos. See their Figure 10.

[40] KHACHATRYAN 17 searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing four or more jets, no more than one lepton, and missing transverse momentum, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop1 simplified model, see Fig. 17.

[41] KHACHATRYAN 17AD searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing at least four jets (including b-jets), missing transverse momentum and tagged top quarks. No evidence for an excess over the expected background is observed. Top

squark masses in the range 250–740 GeV and neutralino masses up to 240 GeV are excluded at 95% C.L. See Fig. 12.

[42] KHACHATRYAN 17AD searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing at least four jets (including b-jets), missing transverse momentum and tagged top quarks. No evidence for an excess over the expected background is observed. Limits are derived on the $\widetilde{t}$ mass in simplified models that are a mixture of Tstop1 and Tstop2 with branching fractions 50% for each of the two decay modes: top squark masses of up to 610 GeV and neutralino masses up to 190 GeV are excluded at 95% C.L. The $\widetilde{\chi}_1^\pm$ and the $\widetilde{\chi}_1^0$ are assumed to be nearly degenerate in mass, with a 5 GeV difference between their masses. See Fig. 12.

[43] KHACHATRYAN 17P searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figures 7 and 8. Limits are also set on the squark mass in the Tsqk1 simplified model, see their Fig. 7, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 8. Finally, limits are set on the stop mass in the Tstop1, Tstop3, Tstop4, Tstop6 and Tstop7 simplified models, see Fig. 8.

[44] KHACHATRYAN 17S searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing multiple jets and missing transverse momentum, using the α_T variable to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop4 model: for Δm $= m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0}$ equal to 10 and 80 GeV, masses of stop below 240 and 260 GeV are excluded, respectively. See their Fig.3.

[45] KHACHATRYAN 17S searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing multiple jets and missing transverse momentum, using the α_T variable to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop3 model: for Δm $= m_{\widetilde{t}} - m_{\widetilde{\chi}_1^0}$ equal to 10 and 80 GeV, masses of stop below 225 and 130 GeV are excluded, respectively. See their Fig.3.

[46] KHACHATRYAN 17S searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing multiple jets and missing transverse momentum, using the α_T variable to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop2 model: assuming $m_{\widetilde{\chi}_1^\pm} = 0.25\ m_{\widetilde{t}} + 0.75\ m_{\widetilde{\chi}_1^0}$, masses of stop up to 325 GeV and masses of the neutralino up to 225 GeV are excluded. See their Fig.3.

[47] KHACHATRYAN 17S searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing multiple jets and missing transverse momentum, using the α_T variable to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop2 model: assuming $m_{\widetilde{\chi}_1^\pm} = 0.75\ m_{\widetilde{t}} + 0.25\ m_{\widetilde{\chi}_1^0}$, masses of stop up to 400 GeV are excluded for low neutralino masses. See their Fig.3.

[48] KHACHATRYAN 17S searched in 18.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing multiple jets and missing transverse momentum, using the α_T variable to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the stop mass in the Tstop1 model: assuming masses of stop up to 500 GeV and masses of the neutralino up to 105 GeV are excluded. See their Fig.3.

[49] SIRUNYAN 17AS searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with a single lepton (electron or muon), jets, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop2 and Tstop8 simplified models, see their Figures 5, 6 and 7.

[50] SIRUNYAN 17AT searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for direct production of top squarks in events with jets and large $\not{E}_T$. No significant excess above

the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop2 , Tstop3, Tstop4, Tstop8 and Tstop10 simplified models, see their Figures 9 to 14.

[51] SIRUNYAN 17AZ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A simplified models, see their Figures 6. Limits are also set on the squark mass in the Tsqk1 simplified model (for single light squark and for 8 degenerate light squarks), on the sbottom mass in the Tsbot1 simplified model and on the stop mass in the Tstop1 simplified model, see their Fig. 7. Finally, limits are set on the stop mass in the Tstop2, Tstop4 and Tstop8 simplified models, see Fig. 8.

[52] SIRUNYAN 17K searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for direct production of stop or sbottom pairs in events with multiple jets and significant $\not{E}_T$. A second search also requires an isolated lepton and is combined with the all-hadronic search. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1, Tstop8 and Tstop4 simplified models, see their Figures 7, 8 and 9 (for the Tstop4 limits, only the results of the all-hadronic search are used). Limits are also set on the sbottom mass in the Tsbot1 simplified model, see Fig. 10 (also here, only the results of the all-hadronic search are used).

[53] SIRUNYAN 17P searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A, Tglu3A and Tglu3D simplified models, see their Fig. 12. Limits are also set on the squark mass in the Tsqk1 simplified model, on the stop mass in the Tstop1 simplified model, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 13.

[54] AABOUD 16D searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with an energetic jet and large missing transverse momentum. The results are interpreted as 95% C.L. limits on mass of stop decaying into a charm-quark and the lightest neutralino in scenarios with $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ between 5 and 20 GeV. See their Fig. 5.

[55] AABOUD 16J searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in final states with one isolated electron or muon, jets, and missing transverse momentum. For the direct stop pair production model where the stop decays via top and lightest neutralino, the results exclude at 95% C.L. stop masses between 745 GeV and 780 GeV for a massless $\widetilde{\chi}^0_1$. See their Fig. 8.

[56] AAD 16AY searched in 20 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with either two hadronically decaying tau leptons, one hadronically decaying tau and one light lepton, or two light leptons. No significant excess over the Standard Model expectation is found. Exclusion limits at 95% C.L. on the mass of top squarks decaying via $\widetilde{\tau}$ to a nearly massless gravitino are placed depending on $m_{\widetilde{\tau}}$ which is ranging from the 87 GeV LEP limit to $m_{\widetilde{t}_1}$. See their Figs. 9 and 10.

[57] KHACHATRYAN 16AV searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with one or two isolated leptons, hadronic jets, b-jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 and Tstop2 simplified models, see Fig. 11.

[58] KHACHATRYAN 16BK searched in 18.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with hadronic jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 and Tstop2 simplified models, see Fig. 16.

[59] KHACHATRYAN 16BS searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one energetic jet , no isolated leptons, and significant $\not{E}_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 simplified model, see Fig. 11 and Table 3.

[60] KHACHATRYAN 16Y searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with one or two soft isolated leptons, hadronic jets, and $\not{E}_T$. No significant excess above

the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop3 simplified model, see Fig. 3.

[61] AAD 15CJ searched in 20 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of third generation squarks by combining a large number of searches covering various final states. Stop decays with and without charginos in the decay chain are considered and summaries of all ATLAS Run 1 searches for direct stop production can be found in Fig. 4 (no intermediate charginos) and Fig. 7 (intermediate charginos). Limits are set on stop masses in compressed mass regions regions, with B($\widetilde{t} \rightarrow c\widetilde{\chi}_1^0$) + B($\widetilde{t} \rightarrow bff'\widetilde{\chi}_1^0$) = 1, see Fig. 5. Limits are also set on stop masses assuming that both the decay $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ and $\widetilde{t} \rightarrow b\widetilde{\chi}_1^\pm$ are possible, with both their branching rations summing up to 1, assuming $\widetilde{\chi}_1^\pm \rightarrow W^{(*)}\widetilde{\chi}_1^0$ and $m_{\widetilde{\chi}_1^\pm} = 2\, m_{\widetilde{\chi}_1^0}$, see Fig. 6. Limits on the mass of the next-to-lightest stop $\widetilde{t}_2$, decaying either to $Z\widetilde{t}_1$, $h\widetilde{t}_1$ or $t\widetilde{\chi}_1^0$, are also presented, see Figs. 9 and 10.Interpretations in the pMSSM are also discussed, see Figs 13–15.

[62] AAD 15J interpreted the measurement of spin correlations in $t\overline{t}$ production using 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV in exclusion limits on the pair production of light $\widetilde{t}_1$ squarks with masses similar to the top quark mass. The $\widetilde{t}_1$ is assumed to decay through $\widetilde{t}_1 \rightarrow t\widetilde{\chi}_1^0$ with predominantly right-handed top and a 100% branching ratio. The data are found to be consistent with the Standard Model expectations and masses between the top quark mass and 191 GeV are excluded, see their Fig. 2

[63] KHACHATRYAN 15AF searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least two energetic jets and significant $\not{E}_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in simplified models where the decay $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 12. See also Table 5. Exclusions in the CMSSM, assuming tanβ = 30, $A_0 = -2$ max(m_0, $m_{1/2}$) and $\mu > 0$, are also presented, see Fig. 15.

[64] KHACHATRYAN 15AH searched in 19.4 or 19.7 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing either a fully reconstructed top quark, or events containing dijets requiring one or both jets to originate from b-quarks, or events containing a mono-jet. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in simplified models where the decay $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 9. Limits are also set in simplified models where the decays $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ and $\widetilde{t} \rightarrow b\widetilde{\chi}_1^\pm$, with $m_{\widetilde{\chi}_1^\pm}$ - $m_{\widetilde{\chi}_1^0}$ = 5 GeV, each take place with a branching ratio of 50%, see Fig. 10, or with other fractions, see Fig. 11. Finally, limits are set in a simplified model where the decay $\widetilde{t} \rightarrow c\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Figs. 9, 10 and 11.

[65] KHACHATRYAN 15AH searched in 19.4 or 19.7 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing either a fully reconstructed top quark, or events containing dijets requiring one or both jets to originate from b-quarks, or events containing a mono-jet. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in simplified models where the decay $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 9. Limits are also set in simplified models where the decays $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ and $\widetilde{t} \rightarrow b\widetilde{\chi}_1^\pm$, with $m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0} = 5$ GeV, each take place with a branching ratio of 50%, see Fig. 10, or with other fractions, see Fig. 11. Finally, limits are set in a simplified model where the decay $\widetilde{t} \rightarrow c\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Figs. 9, 10, and 11.

[66] KHACHATRYAN 15L searched in 19.4 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for pair production of heavy resonances decaying to pairs of jets in four jet events. No significant excess above the Standard Model expectations is observed. Limits are set on the stop

mass in R-parity-violating supersymmetry models where $\widetilde{t} \rightarrow qq$ ($\lambda''_{312} \neq 0$), see Fig. 6 (top) and $\widetilde{t} \rightarrow qb$ ($\lambda''_{323} \neq 0$), see Fig. 6 (bottom).

[67] KHACHATRYAN 15X searched in 19.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least two energetic jets, at least one of which is required to originate from a b quark, possibly a lepton, and significant $\not\!\!E_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in simplified models where the decay $\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$ and the decay $\widetilde{t} \rightarrow b\widetilde{\chi}^\pm_1$, with $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1} = 5$ GeV, take place with branching ratios varying between 0 and 100%, see Figs. 15, 16 and 17.

[68] AAD 14AJ searched in 20.1 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing four or more jets and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks in simplified models which either assume that the decay $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$ takes place 100% of the time, see Fig. 8, or that this decay takes place 50% of the time, while the decay $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^\pm_1$ takes place the other 50% of the time, see Fig. 9.

[69] AAD 14BD searched in 20 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing one isolated lepton, jets and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks in simplified models which either assume that the decay $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$ takes place 100% of the time, see Fig. 15, or the decay $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^\pm_1$ takes place 100% of the time, see Fig. 16–22. For the mixed decay scenario, see Fig. 23.

[70] AAD 14F searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing two leptons (e or μ), and possibly jets and missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks in simplified models which either assume that the decay $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^\pm_1$ takes place 100% of the time, see Figs. 14–17 and 20, or that the decay $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$ takes place 100% of the time, see Figs. 18 and 19.

[71] AAD 14T searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for monojet-like and c-tagged events. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the masses of third-generation squarks in simplified models which assume that the decay $\widetilde{t}_1 \rightarrow c\widetilde{\chi}^0_1$ takes place 100% of the time, see Fig. 9 and 10. The results of the monojet-like analysis are also interpreted in terms of stop pair production in the four-body decay $\widetilde{t}_1 \rightarrow bff'\widetilde{\chi}^0_1$, see Fig. 11.

[72] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s} = 7$ TeV for events with at least two energetic jets and significant $\not\!\!E_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. A second analysis requires at least one of the jets to be originating from a b-quark. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$ takes place with a branching ratio of 100%, see Figs. 28 and 29. Exclusions in the CMSSM, assuming tan$\beta = 10$, $A_0 = 0$ and $\mu > 0$, are also presented, see Fig. 26.

[73] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in a natural higgsino NLSP simplified model (GMSB) where the decay $\widetilde{t} \rightarrow b\widetilde{\chi}^\pm_1$, with $\widetilde{\chi}^\pm_1 \rightarrow (qq'/\ell\nu)H,\ Z\widetilde{G}$, takes place with a branching ratio of 100% (the particles between brackets have a soft p_T spectrum), see Figs. 4–6.

[74] KHACHATRYAN 14T searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with τ-leptons and b-quark jets, possibly with extra light-flavour jets. No excess above the Standard Model expectations is observed. Limits are set on stop masses in RPV SUSY models with $LQ\overline{D}$ couplings, in two simplified models. In the first model, the decay $\widetilde{t} \rightarrow \tau b$ is considered, with $\lambda'_{333} \neq 0$, see Fig. 3. In the second model, the decay $\widetilde{t} \rightarrow \widetilde{\chi}^{\pm} b$, with the subsequent decay $\widetilde{\chi}^{\pm} \rightarrow q q \tau^{\pm}$ is considered, with $\lambda'_{3jk} \neq 0$ and the mass splitting between the top squark and the charging chosen to be 100 GeV, see Fig. 4.

[75] AABOUD 17AF searched in 36 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for evidence of top squarks in events containing 2 leptons, jets, b-jets and $\not{E}_T$. In Tstop6 model, assuming $m_{\widetilde{\chi}^0_1}$ = 0 GeV, $\widetilde{t}_1$ masses up to 850 GeV are excluded for $m_{\widetilde{\chi}^0_2}$ > 200 GeV.

[76] AABOUD 17AF searched in 36 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for evidence of $\widetilde{t}_2$ in events containing 2 leptons, jets, b-jets and $\not{E}_T$. In Tstop7 model, assuming $m_{\widetilde{\chi}^0_1}$ = 50 GeV and 100% decays via Z boson, $\widetilde{t}_2$ masses up to 800 GeV are excluded. Exclusion limits are also shown as a function of the $\widetilde{t}_2$ branching ratios in their Figure 7.

[77] AABOUD 17AF searched in 36 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for evidence of $\widetilde{t}_2$ in events containing 2 leptons, jets, b-jets and $\not{E}_T$. In Tstop7 model, assuming $m_{\widetilde{\chi}^0_1}$ = 50 GeV and 100% decays via higgs boson, $\widetilde{t}_2$ masses up to 880 GeV are excluded. Exclusion limits are also shown as a function of the $\widetilde{t}_2$ branching ratios in their Figure 7.

[78] AABOUD 17AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least four jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits are set on the top squark mass assuming three pMSSM-inspired models. The first one, referred to as Higgsino LSP model, assumes $m_{\widetilde{\chi}^\pm_1} - m_{\widetilde{\chi}^0_1}$ = 5 GeV and $m_{\widetilde{\chi}^0_2} - m_{\widetilde{\chi}^0_1}$ = 10 GeV, with a mixture of decay modes as in Tstop1, Tstop2 and Tstop6. See their Figure 10. The second and third models are referred to as Wino NLSP and well-tempered pMSSM models, respectively. See their Figure 11 and Figure 12, and text for details on assumptions.

[79] AAD 14B searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing a Z boson, with or without additional leptons, plus jets originating from b-quarks and significant missing transverse momentum. No excess over the expected SM background is observed. Limits are derived in simplified models featuring $\widetilde{t}_2$ production, with $\widetilde{t}_2 \rightarrow Z \widetilde{t}_1$, $\widetilde{t}_1 \rightarrow t \widetilde{\chi}^0_1$ with a 100% branching ratio, see Fig. 4, and in the framework of natural GMSB, see Fig. 6.

[80] CHATRCHYAN 14U searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of direct pair production of top squarks, with Higgs bosons in the decay chain. The search is performed using a selection of events containing two Higgs bosons, each decaying to a photon pair, missing transverse energy and possibly b-quark jets. No significant excesses over the expected SM backgrounds are observed. The results are interpreted in the context of a "natural SUSY" simplified model where the decays $\widetilde{t}_1 \rightarrow b \widetilde{\chi}^{\pm}_1$, with $\widetilde{\chi}^{\pm}_1 \rightarrow f f' \widetilde{\chi}^0_1$, and $\widetilde{\chi}^0_1 \rightarrow H \widetilde{G}$, all happen with 100% branching ratio, see Fig. 4.

[81] KHACHATRYAN 14C searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for evidence of direct pair production of top squarks, with Higgs or Z-bosons in the decay chain. The search is performed using a selection of events containing leptons and b-quark jets. No significant excesses over the expected SM backgrounds are observed. The results are interpreted in the context of a simplified model with pair production of a heavier top-squark mass eigenstate $\widetilde{t}_2$ decaying to a lighter top-squark eigenstate $\widetilde{t}_1$ via either $\widetilde{t}_2 \rightarrow H \widetilde{t}_1$ or $\widetilde{t}_2 \rightarrow Z \widetilde{t}_1$, followed in both cases by $\widetilde{t}_1 \rightarrow t \widetilde{\chi}^0_1$. The interpretation is performed in the region where the mass difference between the $\widetilde{t}_1$ and $\widetilde{\chi}^0_1$ is approximately equal to the top-quark mass, which is not probed by searches for direct $\widetilde{t}_1$ pair production, see Figs. 5 and 6. The analysis excludes top squarks with masses $m_{\widetilde{t}_2}$ < 575 GeV and $m_{\widetilde{t}_1}$ < 400 GeV at 95% C.L.

R-parity violating $\widetilde{t}$ (Stop) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1700	95	[1] AAD	20M	ATLS	$\widetilde{t} \to q\mu$, long-lived, Tstop3RPV, $\tau = 0.1$ ns
>1150	95	[2] SIRUNYAN	19BI	ATLS	$\widetilde{t} \to b\mu$, long-lived, Tstop2RPV, c$\tau = 0.1$ cm
>1100	95	[3] SIRUNYAN	19BJ	CMS	$\widetilde{t} \to be$, Tstop2RPV, prompt
none 100–410	95	[4] AABOUD	18BB	ATLS	4 jets, Tstop1RPV with $\widetilde{t} \to ds$, λ''_{312} coupling
none 100–470, 480–610	95	[5] AABOUD	18BB	ATLS	4 jets, Tstop1RPV, λ''_{323} coupling
$\geq$ 600–1500	95	[6] AABOUD	18P	ATLS	2ℓ + b-jets, Tstop2RPV, depending on λ'_{i33} coupling (i = 1, 2, 3)
>1130	95	[7] SIRUNYAN	18AD	CMS	$\widetilde{t} \to b\ell$, long-lived, cτ = 70–100 mm
> 550	95	[7] SIRUNYAN	18AD	CMS	$\widetilde{t} \to b\ell$, long-lived, cτ = 1–1000 mm
>1400	95	[8] SIRUNYAN	18DV	CMS	long-lived $\widetilde{t}$, RPV, $\widetilde{t} \to \overline{d}\,\overline{d}$, 0.6 mm < c$\tau$ < 80 mm
none 80–520	95	[9] SIRUNYAN	18DY	CMS	2, 4 jets, Tstop3RPV, λ''_{312} coupling
none 80–270, 285–340, 400–525	95	[9] SIRUNYAN	18DY	CMS	2 , 4 jets, Tstop1RPV, λ''_{323} coupling
>1200	95	[10] AABOUD	17AI	ATLS	$\geq 1\ell+ \geq 8$ jets, Tstop1 with $\widetilde{\chi}^0_1 \to tbs$, λ''_{323} coupling, $m_{\widetilde{\chi}^0_1}$=500 GeV
none, 100–315	95	[11] AAD	16AM	ATLS	2 large-radius jets, Tstop1RPV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
> 770	95	[12] AAD	21B	ATLS	≥ 8 jets, ≥ 5 b-jets,Tstop4RPV
> 890	95	[13] KHACHATRY...	16AC	CMS	$e^+e^- + \geq 5$ jets; $\widetilde{t} \to b\widetilde{\chi}^\pm_1$; $\widetilde{\chi}^\pm_1 \to \ell^\pm jj$, λ'_{ijk}
>1000	95	[13] KHACHATRY...	16AC	CMS	$\mu^+\mu^- + \geq 5$ jets; $\widetilde{t} \to b\widetilde{\chi}^\pm_1$; $\widetilde{\chi}^\pm_1 \to \ell^\pm jj$, λ'_{ijk}
> 950	95	[14] KHACHATRY...	16BX	CMS	$\widetilde{t} \to t\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \to \ell\ell\nu$, λ_{121} or $\lambda_{122} \neq 0$
> 790	95	[15] KHACHATRY...	15E	CMS	$\widetilde{t}_1 \to b\ell$, c$\tau$ = 2 cm

[1] AAD 20M searched for long-lived particles decaying into hadrons and at least one muon in events containing a displaced muon track and a displaced vertex. The analysis uses a dataset of pp collisions at $\sqrt{s}$ = 13 TeV corresponding to an integrated luminosity of 136 fb^{-1}. Using the Tstop3RPV simplified model, top squarks with masses up to 1.7 TeV are excluded for a lifetime of 0.1 ns, and masses below 1.3 TeV are excluded for lifetimes between 0.01 ns and 30 ns, see their Fig. 7. The dependence on the RPV coupling λ_{23k} multiplied by cosθ_t, with θ_t the mixing angle between the left- and right-handed $\widetilde{t}$ squarks, is also shown, see their Fig. 7.

[2] SIRUNYAN 19BI searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in final states with two muons and two jets, or with one muon, two jets, and missing transverse momentum. Limits are set in a model of pair-produced, prompt or long-lived top squarks with R-parity violating decays to a b-quark and a lepton (Tstop2RPV), branching fraction of $\widetilde{t} \to b\mu$ equal to 1/3 and cτ between 0.1 cm and 10 cm in the case of long-lived top squarks. See their Fig. 10.

[3] SIRUNYAN 19BJ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with two electrons and two jets, or with one electron, two jets, and missing transverse momentum. Limits are set in a model of pair-produced, prompt top squarks with R-parity violating decays to a b-quark and a lepton (Tstop2RPV), assuming branching fraction of $\widetilde{t} \rightarrow be$ equal to 1/3 and c$\tau = 0$ cm. See their Fig.10.

[4] AABOUD 18BB searched in 36.7 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for massive colored resonances which are pair-produced and decay into two jets. No significant deviation from the background prediction is observed. Results are interpreted in a SUSY simplified model as Tstop1RPV with $\widetilde{t} \rightarrow ds$. Top squarks with masses in the range 100–410 GeV are excluded, see their Figure 9(a). The λ''_{312} coupling is assumed to be sufficiently large for the decays to be prompt, but small enough to neglect the single-top-squark resonant production through RPV couplings.

[5] AABOUD 18BB searched in 36.7 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for massive coloured resonances which are pair-produced and decay into two jets. No significant deviation from the background prediction is observed. Results are interpreted in Tstop1RPV. Top squarks with masses in the range 100–470 GeV or 480–610 GeV are excluded, see their Figure 9(b). The λ''_{323} coupling is assumed to be sufficiently large for the decays to be prompt, but small enough to neglect the single-top-squark resonant production through RPV couplings.

[6] AABOUD 18P searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for pair-produced top squarks that decay through RPV λ'_{i33} (i = 1, 2, 3) couplings to a final state with two leptons and two jets, at least one of which is identified as a b-jet. No significant excess is observed over the SM background. In the Tstop2RPV model, lower limits on the top squark masses between 600 and 1500 GeV are set depending on the branching fraction to be, $b\mu$, and $b\tau$ final states. See their Figs 6 and 7.

[7] SIRUNYAN 18AD searched in 2.6 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for long-lived particles by exploiting the multiplicity of displaced jets to search for the presence of signal decays occurring at distances between 1 and 1000 mm. Limits are set in a model of pair-produced, long-lived top squarks with R-parity violating decays to a b-quark and a lepton, see their Figure 3.

[8] SIRUNYAN 18DV searched in 38.5 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for long-lived particles in events with multiple jets and two displaced vertices composed of many tracks. No events with two well-separated high-track-multiplicity vertices were observed. Limits are set on the stop and the gluino mass in RPV models of supersymmetry where the stop (gluino) is decaying solely into dijet (multijet) final states, see their Figures 6 and 7.

[9] SIRUNYAN 18DY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for the pair production of resonances, each decaying to two quarks. The search is conducted separately in a boosted (two-jet) and resolved (four-jet) jet topology. The mass spectra are found to be consistent with the Standard Model expectations. Limits are set on the stop mass in the Tstop3RPV and Tstop1RPV simplified models, see their Figure 11.

[10] AABOUD 17AI searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more isolated lepton, at least eight jets, either zero or many b-jets, for evidence of R-parity violating decays of the top squark. No significant excess above the Standard Model expectations is observed. Limits up to 1.25 (1.10) TeV are set on the top squark mass in R-parity-violating supersymmetry models where $\widetilde{t}_1$ decays for a bino LSP as: $\widetilde{t} \rightarrow t\widetilde{\chi}^0_1$ and for a higgsino LSP as $\widetilde{t} \rightarrow t\widetilde{\chi}^0_{1,2}/b\widetilde{\chi}^+_1$. These is followed by the decays through the non-zero λ''_{323} coupling $\widetilde{\chi}^0_{1,2} \rightarrow tbs$, $\widetilde{\chi}^\pm_1 \rightarrow bbs$. See their Figure 10 and text for details on model assumptions.

[11] AAD 16AM searched in 17.4 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing two large-radius hadronic jets. No deviation from the background prediction is observed. Top squarks with masses between 100 and 315 GeV are excluded at 95% C.L. in the hypothesis that they both decay via R-parity violating coupling λ''_{323} to b- and s-quarks. See their Fig. 10.

[12] AAD 21B searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least eight jets and at least 5 b-jets, for evidence of R-parity violating decays of the top squark. No significant excess above the Standard Model expectations is observed. Limits up to 950 GeV are set on the top squark mass in Tstop4RPV simplified model. See their Figure 7 for more detailed mass bounds.

[13] KHACHATRYAN 16AC searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with low missing transverse momentum, two oppositely charged electrons or muons, and at least five jets, at least one of which is a b-jet, for evidence of R-parity violating, charging-mediated decays of the top squark. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in R-parity-violating supersymmetry models where $\widetilde{t} \to b\widetilde{\chi}_1^{\pm}$ with $\widetilde{\chi}_1^{\pm} \to \ell^{\pm} jj$, $\lambda'_{ijk} \neq 0$ ($i,j,k \leq 2$), and with $m_{\widetilde{t}} - m_{\widetilde{\chi}_1^{\pm}}$ = 100 GeV, see Fig. 3.

[14] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing 4 leptons coming from R-parity-violating decays of $\widetilde{\chi}_1^0 \to \ell\ell\nu$ with $\lambda_{121} \neq 0$ or $\lambda_{122} \neq 0$. No excess over the expected background is observed. Limits are derived on the gluino, squark and stop masses, see Fig. 23.

[15] KHACHATRYAN 15E searched for long-lived particles decaying to leptons in 19.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. Events were selected with an electron and muon with opposite charges and each with transverse impact parameter values between 0.02 and 2 cm. Limits are set on SUSY benchmark models with pair production of top squarks decaying into an $e\mu$ final state via RPV interactions. See their Fig. 2

Heavy $\widetilde{g}$ (Gluino) mass limit

For $m_{\widetilde{g}}$ > 60–70 GeV, it is expected that gluinos would undergo a cascade decay via a number of neutralinos and/or charginos rather than undergo a direct decay to photinos as assumed by some papers. Limits obtained when direct decay is assumed are usually higher than limits when cascade decays are included.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

R-parity conserving heavy $\widetilde{g}$ (Gluino) mass limit

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>1980	95	[1] AAD	20AL	ATLS	8 or more jets + $\not\!\!E_T$, Tglu1E, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1820	95	[1] AAD	20AL	ATLS	8 or more jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1600	95	[2] AAD	20V	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets, Tglu1E, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1975	95	[3] SIRUNYAN	20B	CMS	$\geq 1\gamma$ + $\not\!\!E_T$, Tglu4A, BR($\widetilde{g} \to qq\widetilde{\chi}_1^{\pm}$)=0.5, $m_{\widetilde{\chi}_1^0} \simeq m_{\widetilde{g}}$
>1920	95	[4] SIRUNYAN	20BJ	CMS	jets+$\not\!\!E_T$, Tglu1H, $m_{\widetilde{g}} - m_{\widetilde{\chi}_2^0}$ = 50 GeV, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
>2150	95	[5] SIRUNYAN	20E	CMS	1ℓ+jets, Tglu3A, $m_{\widetilde{\chi}_1^0}$ <700 GeV
>2050	95	[5] SIRUNYAN	20E	CMS	1ℓ+jets, Tglu3A, $m_{\widetilde{\chi}_1^0}$ <1100GeV

>1650	95	[5] SIRUNYAN	20E	CMS	1ℓ + jets, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 175 GeV, $m_{\widetilde{\chi}_1^0}$ < 1150 GeV
>1700	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1610	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu3B, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 175 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1300	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$= 20 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1500	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu3D, $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_1^0}$ + 5 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1350	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu1C, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^\pm}$ = $(m_{\widetilde{g}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1250	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu1C, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^\pm}$= $m_{\widetilde{\chi}_1^0}$+20 GeV, $m_{\widetilde{\chi}_1^0}$=0 GeV
>1425	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu1B, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{g}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1425	95	[6] SIRUNYAN	20T	CMS	same-sign $\ell^\pm \ell^\pm$ or $\geq 3\ell^\pm$ + jets, Tglu1B, $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_1^0}$ + 20 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>2000	95	[7] AABOUD	19I	ATL	$\geq$ 2 jets + 1 or 2 τ + $\not\!\!E_T$, Tglu1F, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1860	95	[8] SIRUNYAN	19AG	CMS	2γ +$\not\!\!E_T$, Tglu4B, 500 GeV <$m_{\widetilde{\chi}_1^0}$ < 1500 GeV
>1920	95	[9] SIRUNYAN	19AU	CMS	γ +jets + b-jets + $\not\!\!E_T$, Tglu4D, $m_{\widetilde{\chi}_1^0}$ = 127 GeV
>1950	95	[9] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not\!\!E_T$, Tglu4E, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
>1800	95	[9] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not\!\!E_T$, Tglu4F, $m_{\widetilde{\chi}_1^0}$ = 1 GeV
>2090	95	[9] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not\!\!E_T$, Tglu4D, $m_{\widetilde{\chi}_1^0}$ = 1200 GeV
>2120	95	[9] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not\!\!E_T$, Tglu4E, $m_{\widetilde{\chi}_1^0}$ = 1200 GeV

>1970	95	[9] SIRUNYAN	19AU	CMS	γ + jets + b-jets + $\not\!\!E_T$, Tglu4F, $m_{\widetilde{\chi}^0_1}$ = 1200 GeV
>1700	95	[10] SIRUNYAN	19CE	CMS	2 jets, Stealth SUSY, Tglu1A and $\widetilde{\chi}^0_1 \rightarrow \widetilde{S}\,\gamma$ ($\widetilde{S} \rightarrow S\,\widetilde{G}$), $m_{\widetilde{\chi}^0_1}$ = 200 GeV
>2000	95	[11] SIRUNYAN	19CH	CMS	jets+$\not\!\!E_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>2030	95	[11] SIRUNYAN	19CH	CMS	jets+$\not\!\!E_T$, Tglu1C, $m_{\widetilde{\chi}^\pm_1}$=$m_{\widetilde{\chi}^0_2}$= 0.5($m_{\widetilde{g}}$+$m_{\widetilde{\chi}^0_1}$), $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>2270	95	[11] SIRUNYAN	19CH	CMS	jets+$\not\!\!E_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>2180	95	[11] SIRUNYAN	19CH	CMS	jets+$\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1750	95	[12] SIRUNYAN	19K	CMS	γ+ℓ+$\not\!\!E_T$, Tglu4A, $m_{\widetilde{\chi}^0_1}$ = 1500 GeV
>2000	95	[13] SIRUNYAN	19S	CMS	1 or 2 ℓ + jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 700 GeV
>1900	95	[13] SIRUNYAN	19S	CMS	1 or 2 ℓ + jets + $\not\!\!E_T$, Tglu3C, 150 GeV < $m_{\widetilde{\chi}^0_1}$ < 950 GeV
>1970	95	[14] AABOUD	18AR	ATLS	jets+ $\geq$ 3b-jets+$\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 300 GeV
>1920	95	[15] AABOUD	18AR	ATLS	jets+ $\geq$ 3b-jets+$\not\!\!E_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ < 600 GeV
>1650	95	[16] AABOUD	18AS	ATLS	$\geq$ 4 jets and disappearing tracks from $\widetilde{\chi}^\pm \rightarrow \widetilde{\chi}^0_1 \pi^\pm$, modified Tglu1A or Tglu1B, $\widetilde{\chi}^\pm$ lifetime 0.2 ns, $m_{\widetilde{\chi}^\pm}$ = 460 GeV
>1850	95	[17] AABOUD	18BJ	ATLS	$\ell^\pm \ell^\mp$ + jets + $\not\!\!E_T$, Tglu1G, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1650	95	[18] AABOUD	18BJ	ATLS	$\ell^\pm \ell^\mp$ + jets + $\not\!\!E_T$, Tglu1H, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>2150	95	[19] AABOUD	18U	ATLS	2 γ + $\not\!\!E_T$, GGM, Tglu4B, any NLSP mass
>1600	95	[20] AABOUD	18U	ATLS	γ + jets + $\not\!\!E_T$, GGM higgsino-bino, mix of Tglu4B and Tglu4C, any NLSP mass
>2030	95	[21] AABOUD	18V	ATLS	jets+$\not\!\!E_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1980	95	[22] AABOUD	18V	ATLS	jets+$\not\!\!E_T$, Tglu1B, $m_{\widetilde{\chi}^\pm_1}$=0.5($m_{\widetilde{g}}$+$m_{\widetilde{\chi}^0_1}$), $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1750	95	[23] AABOUD	18V	ATLS	jets+$\not\!\!E_T$, Tglu1C, $m_{\widetilde{\chi}^0_1}$ = 1 GeV, any $m_{\widetilde{\chi}^0_2}$ > 100 GeV
>2000	95	[24] SIRUNYAN	18AA	CMS	$\geq 1\gamma$ + $\not\!\!E_T$, Tglu4A
>2100	95	[24] SIRUNYAN	18AA	CMS	$\geq 1\gamma$ + $\not\!\!E_T$, Tglu4B
>1800	95	[25] SIRUNYAN	18AC	CMS	1ℓ+jets, Tglu3A, $m_{\widetilde{\chi}^0_1}$ <650 GeV
>1700	95	[25] SIRUNYAN	18AC	CMS	1ℓ+jets, Tglu3A,$m_{\widetilde{\chi}^0_1}$ <1040 GeV

>1900	95	[25] SIRUNYAN	18AC	CMS	1ℓ + jets, Tglu1B, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{g}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0} < 300$ GeV
>1250	95	[25] SIRUNYAN	18AC	CMS	1ℓ + jets, Tglu1B, $m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{g}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0} < 950$ GeV
>1610	95	[26] SIRUNYAN	18AL	CMS	$\geq 3\ell^\pm$ + jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1160	95	[26] SIRUNYAN	18AL	CMS	$\geq 3\ell^\pm$ + jets + $\not\!\!E_T$, Tglu1C, $m_{\widetilde{\chi}_2^0} = m_{\widetilde{\chi}_1^\pm} = (m_{\widetilde{g}} + m_{\widetilde{\chi}_1^0})/2$, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1500	95	[27] SIRUNYAN	18AR	CMS	$\ell^\pm\ell^\mp$ + jets + $\not\!\!E_T$, GMSB, Tglu4C, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1770	95	[27] SIRUNYAN	18AR	CMS	$\ell^\pm\ell^\mp$ + jets + $\not\!\!E_T$, GMSB, Tglu4C, $m_{\widetilde{\chi}_1^0} = 1400$ GeV
>1625	95	[28] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu1A, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1825	95	[28] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu2A, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1625	95	[28] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>2040	95	[29] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}_1^0} =$ 0 GeV
>1930	95	[29] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $\not\!\!E_T$, Tglu3B, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 175$ GeV, $m_{\widetilde{\chi}_1^0} = 200$ GeV
>1690	95	[29] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $\not\!\!E_T$, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 20$ GeV, $m_{\widetilde{\chi}_1^0} =$ 0 GeV
>1990	95	[29] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $\not\!\!E_T$, Tglu3E, $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_1^0} + 5$ GeV, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>2010	95	[30] SIRUNYAN	18M	CMS	≥ 1 H ($\rightarrow$ $b\,b$) + $\not\!\!E_T$, Tglu1I
>1825	95	[30] SIRUNYAN	18M	CMS	≥ 1 H ($\rightarrow$ $b\,b$) + $\not\!\!E_T$, Tglu1J
>1750	95	[31] AABOUD	17AJ	ATLS	same-sign $\ell^\pm\ell^\pm$ / 3 ℓ + jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1570	95	[32] AABOUD	17AJ	ATLS	same-sign $\ell^\pm\ell^\pm$ / 3 ℓ + jets + $\not\!\!E_T$, Tglu1E, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1860	95	[33] AABOUD	17AJ	ATLS	same-sign $\ell^\pm\ell^\pm$ / 3 ℓ + jets + $\not\!\!E_T$, Tglu1G, $m_{\widetilde{\chi}_1^0} = 200$ GeV
>2100	95	[34] AABOUD	17AR	ATLS	1ℓ+jets+$\not\!\!E_T$, Tglu1B, $m_{\widetilde{\chi}_1^0} = 0$ GeV
>1740	95	[35] AABOUD	17AR	ATLS	1ℓ+jets+$\not\!\!E_T$, Tglu1E, $m_{\widetilde{\chi}_1^0} = 0$ GeV

>1800	95	[36] AABOUD	17AY	ATLS	jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{t}_1}-m_{\widetilde{\chi}^0_1}$ = 5 GeV
>1800	95	[37] AABOUD	17AZ	ATLS	$\geq$ 7 jets+$\not{E}_T$, large R-jets and/or b-jets, Tglu1E, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1540	95	[38] AABOUD	17AZ	ATLS	$\geq$ 7 jets+$\not{E}_T$, large R-jets and/or b-jets, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1340	95	[39] AABOUD	17N	ATLS	2 same-flavor, opposite-sign ℓ + jets + $\not{E}_T$, Tglu1H, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1310	95	[40] AABOUD	17N	ATLS	2 same-flavor, opposite-sign ℓ + jets + $\not{E}_T$, Tglu1H, $m_{\widetilde{\chi}^0_2}$ = $(m_{\widetilde{g}}+m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ < 400 GeV
>1700	95	[41] AABOUD	17N	ATLS	2 same-flavor, opposite-sign ℓ + jets + $\not{E}_T$, Tglu1G, $m_{\widetilde{\chi}^0_1}$ ∼ 1 GeV
>1400	95	[42] KHACHATRY...	17	CMS	jets+$\not{E}_T$,Tglu1A,$m_{\widetilde{\chi}^0_1}$=200GeV
>1650	95	[42] KHACHATRY...	17	CMS	jets+$\not{E}_T$,Tglu2A,$m_{\widetilde{\chi}^0_1}$=200 GeV
>1600	95	[42] KHACHATRY...	17	CMS	jets+$\not{E}_T$,Tglu3A,$m_{\widetilde{\chi}^0_1}$=200GeV
>1550	95	[43] KHACHATRY...	17AD	CMS	jets+b-jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1450	95	[44] KHACHATRY...	17AD	CMS	jets+b-jets+$\not{E}_T$, Tglu3C, 200 < $m_{\widetilde{\chi}^0_1}$ < 400 GeV
>1570	95	[45] KHACHATRY...	17AS	CMS	1ℓ, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 600 GeV
>1500	95	[45] KHACHATRY...	17AS	CMS	1ℓ, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 775 GeV
>1400	95	[45] KHACHATRY...	17AS	CMS	1ℓ, Tglu1B, $m_{\widetilde{\chi}^\pm_1}$ = $(m_{\widetilde{g}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ < 725 GeV
none 1050–1350	95	[45] KHACHATRY...	17AS	CMS	1ℓ, Tglu1B, $m_{\widetilde{\chi}^\pm_1}$ = $(m_{\widetilde{g}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ < 850 GeV
>1175	95	[46] KHACHATRY...	17AW	CMS	$\geq 3\ell^\pm$, 2 jets, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 825	95	[46] KHACHATRY...	17AW	CMS	$\geq 3\ell^\pm$, 2 jets, Tglu1C, $m_{\widetilde{\chi}^\pm_1}$ = $(m_{\widetilde{g}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1350	95	[47] KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1545	95	[47] KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1120	95	[47] KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV

>1300	95	47 KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu3D, $m_{\widetilde{\chi}_1^\pm}$ = $m_{\widetilde{\chi}_1^0}$ + 5 GeV, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 780	95	47 KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu3B, $m_{\widetilde{t}_1}$ −$m_{\widetilde{\chi}_1^0}$ = 175 GeV, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
> 790	95	47 KHACHATRY...	17P	CMS	1 or more jets+$\not{E}_T$, Tglu3C, $m_{\widetilde{t}_1}$ −$m_{\widetilde{\chi}_1^0}$ = 20 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1650	95	48 KHACHATRY...	17V	CMS	2 γ + $\not{E}_T$, GGM, Tglu4B, any NLSP mass
>1900	95	49 SIRUNYAN	17AF	CMS	1ℓ+jets+b-jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1600	95	49 SIRUNYAN	17AF	CMS	1ℓ+jets+b-jets+$\not{E}_T$, Tglu3B, $m_{\widetilde{t}_1}$ − $m_{\widetilde{\chi}_1^0}$ = 175 GeV, $m_{\widetilde{\chi}_1^0}$ = 50 GeV
>1800	95	50 SIRUNYAN	17AY	CMS	γ + jets+$\not{E}_T$, Tglu4B, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1600	95	50 SIRUNYAN	17AY	CMS	γ + jets+$\not{E}_T$, Tglu4A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1860	95	51 SIRUNYAN	17AZ	CMS	$\geq$ 1 jets + $\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>2025	95	51 SIRUNYAN	17AZ	CMS	$\geq$ 1 jets+$\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1900	95	51 SIRUNYAN	17AZ	CMS	$\geq$ 1 jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1825	95	52 SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1950	95	52 SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1960	95	52 SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1800	95	52 SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tglu1C, $m_{\widetilde{\chi}_1^\pm}$ = $m_{\widetilde{\chi}_2^0}$ = ($m_{\widetilde{g}}$+$m_{\widetilde{\chi}_1^0}$)/2, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1870	95	52 SIRUNYAN	17P	CMS	jets+$\not{E}_T$, Tglu3D, $m_{\widetilde{\chi}_1^\pm}$ = $m_{\widetilde{\chi}_1^0}$ + 5 GeV, $m_{\widetilde{\chi}_1^0}$ = 1000 GeV
>1520	95	53 SIRUNYAN	17S	CMS	same-sign $\ell^\pm\ell^\pm$ + jets + $\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
>1200	95	53 SIRUNYAN	17S	CMS	same-sign $\ell^\pm\ell^\pm$ + jets + $\not{E}_T$, Tglu3D, $m_{\widetilde{\chi}_1^\pm}$ = $m_{\widetilde{\chi}_1^0}$ + 5 GeV, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1370	95	53 SIRUNYAN	17S	CMS	same-sign $\ell^\pm\ell^\pm$ + jets + $\not{E}_T$, Tglu3B, $m_{\widetilde{t}_1}$ −$m_{\widetilde{\chi}_1^0}$ = 175 GeV, $m_{\widetilde{\chi}_1^0}$ = 50 GeV

>1180	95	[53] SIRUNYAN	17S	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets + $\not{E}_T$, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 20 GeV, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1280	95	[53] SIRUNYAN	17S	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets + $\not{E}_T$, Tglu1B, $m_{\widetilde{\chi}^{\pm}_1} = (m_{\widetilde{g}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1300	95	[53] SIRUNYAN	17S	CMS	same-sign $\ell^{\pm}\ell^{\pm}$ + jets + $\not{E}_T$, Tglu1B, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 20 GeV, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1570	95	[54] AABOUD	16AC	ATLS	$\geq$ 2 jets + 1 or 2 τ + $\not{E}_T$, Tglu1F, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1460	95	[55] AABOUD	16J	ATLS	1 $\ell^{\pm}$ + $\geq$ 4 jets + $\not{E}_T$, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ = 5 GeV
>1650	95	[56] AABOUD	16M	ATLS	2 γ + $\not{E}_T$, Tglu1D, any NLSP mass
>1510	95	[57] AABOUD	16N	ATLS	$\geq$ 4 jets + $\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1500	95	[58] AABOUD	16N	ATLS	$\geq$ 4 jets + $\not{E}_T$, Tglu1B, $m_{\widetilde{\chi}^{\pm}_1} = (m_{\widetilde{g}}+m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$=200GeV
>1780	95	[59] AAD	16AD	ATLS	0ℓ, $\geq$ 3 b-jets + $\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ < 800 GeV
>1760	95	[60] AAD	16AD	ATLS	1ℓ, $\geq$ 3 b-jets + $\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 700 GeV
>1300	95	[61] AAD	16BB	ATLS	2 same-sign/3ℓ + jets + $\not{E}_T$, Tglu1D, $m_{\widetilde{\chi}^0_1}$ < 600 GeV
>1100	95	[61] AAD	16BB	ATLS	2 same-sign/3ℓ + jets + $\not{E}_T$, Tglu1E, $m_{\widetilde{\chi}^0_1}$ < 300 GeV
>1200	95	[61] AAD	16BB	ATLS	2 same-sign /3ℓ + jets + $\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 600 GeV
>1600		[62] AAD	16BG	ATLS	1ℓ, $\geq$ 4 jets, $\not{E}_T$, Tglu1B, $m_{\widetilde{\chi}^{\pm}_1} = (m_{\widetilde{g}} + m_{\widetilde{\chi}^0_1})/2$, $m_{\widetilde{\chi}^0_1}$= 100 GeV
>1400	95	[63] AAD	16V	ATLS	$\geq$ 7 to $\geq$ 10 jets + $\not{E}_T$, Tglu1E, $m_{\widetilde{\chi}^0_1}$ < 200 GeV
>1400	95	[63] AAD	16V	ATLS	$\geq$ 7 to $\geq$ 10 jets + $\not{E}_T$, pMSSM M_1 = 60 GeV, M_2 = 3 TeV, tanβ=10, μ < 0
>1100	95	[64] KHACHATRY...	16AM	CMS	boosted $W+b$, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$ <80GeV,$m_{\widetilde{\chi}^0_1}$ <400GeV
> 700	95	[64] KHACHATRY...	16AM	CMS	boosted $W+b$, Tglu3B, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}^0_1}$=175 GeV, $m_{\widetilde{\chi}^0_1}$=0 GeV
>1050	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 800 GeV

>1300	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$,Tglu3A,$m_{\widetilde{\chi}^0_1}$=0
>1140	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$, Tglu3B, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = 20 GeV, $m_{\widetilde{\chi}^0_1}$ = 0
> 850	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$, Tglu3B, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$=20 GeV,$m_{\widetilde{\chi}^0_1}$ <700 GeV
> 950	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$, Tglu3D, $m_{\widetilde{\chi}^\pm_1}$ = $m_{\widetilde{\chi}^0_1}$ + 5 GeV
>1100	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$,Tglu1B,$m_{\widetilde{\chi}^\pm_1}$= 0.5($m_{\widetilde{g}}$+$m_{\widetilde{\chi}^0_1}$),$m_{\widetilde{\chi}^0_1}$ <400GeV
> 830	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$,Tglu1B,$m_{\widetilde{\chi}^\pm_1}$= 0.5($m_{\widetilde{g}}$+$m_{\widetilde{\chi}^0_1}$),$m_{\widetilde{\chi}^0_1}$ <700GeV
>1300	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$, Tglu3B, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = m_t, $m_{\widetilde{\chi}^0_1}$ = 0
>1050	95	[65] KHACHATRY...	16BJ	CMS	same-sign $\ell^\pm\ell^\pm$, Tglu3B, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = m_t, $m_{\widetilde{\chi}^0_1}$ < 800 GeV
>1725	95	[66] KHACHATRY...	16BS	CMS	jets + $\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0
>1750	95	[66] KHACHATRY...	16BS	CMS	jets + $\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ = 0
>1550	95	[66] KHACHATRY...	16BS	CMS	jets + $\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0
>1280	95	[67] KHACHATRY...	16BY	CMS	opposite-sign $\ell^\pm\ell^\pm$, Tglu4C, $m_{\widetilde{\chi}^0_1}$ = 1000 GeV
>1030	95	[67] KHACHATRY...	16BY	CMS	opposite-sign $\ell^\pm\ell^\pm$, Tglu4C, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
>1440	95	[68] KHACHATRY...	16V	CMS	jets + $\not{E}_T$, Tglu1A, $m_{\widetilde{\chi}^0_1}$ = 0
>1600	95	[68] KHACHATRY...	16V	CMS	jets + $\not{E}_T$, Tglu2A, $m_{\widetilde{\chi}^0_1}$ = 0
>1550	95	[68] KHACHATRY...	16V	CMS	jets + $\not{E}_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0
>1450	95	[68] KHACHATRY...	16V	CMS	jets + $\not{E}_T$, Tglu1C, $m_{\widetilde{\chi}^0_1}$ = 0
> 820	95	[69] AAD	15BG	ATLS	GGM, $\widetilde{g} \rightarrow q\widetilde{q}Z\widetilde{G}$, tan$\beta$ = 30, μ > 600 GeV
> 850	95	[69] AAD	15BG	ATLS	GGM, $\widetilde{g} \rightarrow q\widetilde{q}Z\widetilde{G}$, tan$\beta$ = 1.5, μ > 450 GeV
>1150	95	[70] AAD	15BV	ATLS	general RPC $\widetilde{g}$ decays, $m_{\widetilde{\chi}^0_1}$ < 100 GeV
> 700	95	[71] AAD	15BX	ATLS	$\widetilde{g} \rightarrow X\widetilde{\chi}^0_1$, independent of $m_{\widetilde{\chi}^0_1}$
>1290	95	[72] AAD	15CA	ATLS	$\geq$ 2 γ + $\not{E}_T$, GGM, bino-like NLSP, any NLSP mass
>1260	95	[72] AAD	15CA	ATLS	$\geq$ 1 γ + b-jets + $\not{E}_T$, GGM, higgsino-bino admix. NLSP and μ <0, m(NLSP)>450 GeV
>1140	95	[72] AAD	15CA	ATLS	$\geq$ 1 γ + jets + $\not{E}_T$, GGM, higgsino-bino admixture NLSP, all μ >0

>1225	95	[73] KHACHATRY...	15AF	CMS	$\tilde{g} \to q\overline{q}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1} = 0$
>1300	95	[73] KHACHATRY...	15AF	CMS	$\tilde{g} \to b\overline{b}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1} = 0$
>1225	95	[73] KHACHATRY...	15AF	CMS	$\tilde{g} \to t\overline{t}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1} = 0$
>1550	95	[73] KHACHATRY...	15AF	CMS	CMSSM, tanβ=30, $m_{\tilde{g}}$=$m_{\tilde{q}}$, A_0=$-$2max(m_0,$m_{1/2}$), μ >0
>1150	95	[73] KHACHATRY...	15AF	CMS	CMSSM, tanβ=30, A_0=$-$2max(m_0,$m_{1/2}$), μ >0
>1280	95	[74] KHACHATRY...	15I	CMS	$\tilde{g} \to t\tilde{t}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1} = 0$
>1310	95	[75] KHACHATRY...	15X	CMS	$\tilde{g} \to b\overline{b}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1}$ = 100 GeV
>1175	95	[75] KHACHATRY...	15X	CMS	$\tilde{g} \to t\overline{t}\tilde{\chi}^0_1$, $m_{\tilde{\chi}^0_1}$ = 100 GeV
>1330	95	[76] AAD	14AE	ATLS	jets + $\not\!\!E_T$, $\tilde{g} \to q\overline{q}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ = 0 GeV
>1700	95	[76] AAD	14AE	ATLS	jets + $\not\!\!E_T$, mSUGRA/CMSSM, $m_{\tilde{q}} = m_{\tilde{g}}$
>1090	95	[77] AAD	14AG	ATLS	τ + jets + $\not\!\!E_T$, natural Gauge Mediation
>1600	95	[77] AAD	14AG	ATLS	τ + jets + $\not\!\!E_T$, mGMSB, M_{mess} = 250 GeV, N_5 = 3, μ > 0, C_{grav} = 1
> 640	95	[78] AAD	14X	ATLS	$\geq 4\ell^{\pm}$, $\tilde{g} \to q\overline{q}\tilde{\chi}^0_1$, $\tilde{\chi}^0_1 \to \ell^{\pm}\ell^{\mp}\tilde{G}$, tan$\beta$ = 30, GGM
>1000	95	[79] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\tilde{g} \to q\overline{q}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ = 50 GeV
>1350	95	[79] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, CMSSM, $m_{\tilde{g}} = m_{\tilde{q}}$
>1000	95	[80] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\tilde{g} \to b\overline{b}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ = 50 GeV
>1000	95	[81] CHATRCHYAN	14AH	CMS	jets + $\not\!\!E_T$, $\tilde{g} \to t\overline{t}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ = 50 GeV
>1160	95	[82] CHATRCHYAN	14I	CMS	jets + $\not\!\!E_T$, $\tilde{g} \to q\overline{q}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ < 100 GeV
>1130	95	[82] CHATRCHYAN	14I	CMS	multijets + $\not\!\!E_T$, $\tilde{g} \to t\overline{t}\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ < 100 GeV
>1210	95	[82] CHATRCHYAN	14I	CMS	multijets + $\not\!\!E_T$, $\tilde{g} \to q\overline{q}W/Z\tilde{\chi}^0_1$ simplified model, $m_{\tilde{\chi}^0_1}$ < 100 GeV
>1260	95	[83] CHATRCHYAN	14N	CMS	$1\ell^{\pm}$+ jets + $\geq$ 2b-jets, $\tilde{g} \to t\overline{t}\chi^0_1$ simplified model, $m_{\chi^0_1}$=0 GeV, $m_{\tilde{t}} > m_{\tilde{g}}$
		[84] CHATRCHYAN	14R	CMS	$\geq 3\ell^{\pm}$, $(\tilde{g}/\tilde{q}) \to q\ell^{\pm}\ell^{\mp}\tilde{G}$ simplified model, GMSB, slepton co-NLSP scenario
		[85] CHATRCHYAN	14R	CMS	$\geq 3\ell^{\pm}$, $\tilde{g} \to t\overline{t}\tilde{\chi}^0_1$ simplified model

• • • We do not use the following data for averages, fits, limits, etc. • • •

>1500	95	[86] AABOUD	18BJ	ATLS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not\!\!E_T$, Tglu1H, $m_{\widetilde{\chi}^0_1}$ = 1 GeV, any $m_{\widetilde{\chi}^0_2}$
>1770	95	[87] AABOUD	18V	ATLS	jets+$\not\!\!E_T$, Tglu1C-like, 1/2 BR per decay mode, any $m_{\widetilde{\chi}^0_2}-m_{\widetilde{\chi}^0_1}$, $m_{\widetilde{\chi}^0_1}$ = 60 GeV
>1600	95	[88] AABOUD	17AZ	ATLS	$\geq$ 7 jets+$\not\!\!E_T$, large R-jets and/or b-jets, pMSSM, $m_{\widetilde{\chi}^{\pm}_1}$ = 200 GeV
>1600	95	[89] KHACHATRY...	16AY	CMS	1$\ell^{\pm}$ + jets + b-jets + $\not\!\!E_T$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ = 0 GeV
> 500	95	[90] KHACHATRY...	16BT	CMS	19-parameter pMSSM model, global Bayesian analysis, flat prior
	95	[91] AAD	15AB	ATLS	$\widetilde{g} \rightarrow \widetilde{S}g$, c$\tau$ = 1 m, $\widetilde{S} \rightarrow S\widetilde{G}$ and $S \rightarrow gg$, BR = 100%
	95	[92] AAD	15AI	ATLS	$\ell^{\pm}$ + jets + $\not\!\!E_T$
>1600	95	[70] AAD	15BV	ATLS	pMSSM, M$_1$ = 60 GeV, $m_{\widetilde{q}}$ < 1500 GeV
>1280	95	[70] AAD	15BV	ATLS	mSUGRA, m_0 > 2 TeV
>1100	95	[70] AAD	15BV	ATLS	via $\widetilde{\tau}$, natural GMSB, all $m_{\widetilde{\tau}}$
>1330	95	[70] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow q\overline{q}\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
>1500	95	[70] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow \widetilde{q}q$, $\widetilde{q} \rightarrow q\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
>1650	95	[70] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $m_{\widetilde{g}}$ = $m_{\widetilde{q}}$, $m_{\widetilde{\chi}^0_1}$ = 1 GeV
> 850	95	[70] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow g\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ < 550 GeV
>1270	95	[70] AAD	15BV	ATLS	jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow q\overline{q}W\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1150	95	[70] AAD	15BV	ATLS	jets + $\ell^{\pm}\ell^{\pm}$, $\widetilde{g} \rightarrow q\overline{q}WZ\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1320	95	[70] AAD	15BV	ATLS	jets + $\ell^{\pm}\ell^{\pm}$, $\widetilde{g}$ decays via sleptons, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1220	95	[70] AAD	15BV	ATLS	τ, $\widetilde{q}$ decays via staus, $m_{\widetilde{\chi}^0_1}$ = 100 GeV
>1310	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}^0_1$, $m_{\widetilde{\chi}^0_1}$ < 400 GeV
>1220	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$, m_{T_1} < 1000 GeV
>1180	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^{\pm}_1$, m_{T_1} < 1000 GeV, $m_{\widetilde{\chi}^0_1}$ = 60 GeV
>1260	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{g} \rightarrow c\widetilde{\chi}^0_1$

>1200	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{b}_1 b$ and $\widetilde{b}_1 \rightarrow b \widetilde{\chi}_1^0$, $m_{\widetilde{b}_1} < 1000$ GeV
>1250	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow b \overline{b} \widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} < 400$ GeV
none, 750–1250	95	[70] AAD	15BV	ATLS	b-jets, $\widetilde{g}$ decay via offshell $\widetilde{t}_1$ and $\widetilde{b}_1$, $m_{\widetilde{\chi}_1^0} < 500$ GeV
>1100	95	[93] AAD	15CB	ATLS	jets, $\widetilde{g} \rightarrow q q \widetilde{\chi}_1^0$, $\widetilde{\chi}_1^0 \rightarrow Z \widetilde{G}$, GGM, $m_{\widetilde{\chi}_1^0} = 400$ GeV and $3 < c\tau_{\widetilde{\chi}_1^0} < 500$ mm
>1400	95	[93] AAD	15CB	ATLS	jets or $\not\!\!E_T$, $\widetilde{g} \rightarrow q q \widetilde{\chi}_1^0$, Split SUSY, $m_{\widetilde{\chi}_1^0} = 100$ GeV and $15 < c\tau < 300$ mm
>1500	95	[93] AAD	15CB	ATLS	$\not\!\!E_T$, $\widetilde{g} \rightarrow q q \widetilde{\chi}_1^0$, Split SUSY, $m_{\widetilde{\chi}_1^0} = 100$ GeV and $20 < c\tau < 250$ mm
		[94] KHACHATRY...	15AD	CMS	$\ell^{\pm}\ell^{\mp}$ + jets + $\not\!\!E_T$, GMSB, $\widetilde{g} \rightarrow q \overline{q} Z \widetilde{G}$
>1300	95	[95] KHACHATRY...	15AZ	CMS	$\geq 2\ \gamma$, ≥ 1 jet, (Razor), bino-like NLSP, $m_{\widetilde{\chi}_1^0} = 375$ GeV
> 800	95	[95] KHACHATRY...	15AZ	CMS	$\geq 1\ \gamma$, ≥ 2 jet, wino-like NLSP, $m_{\widetilde{\chi}_1^0} = 375$ GeV
>1280	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, CMSSM
>1250	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow \widetilde{b}_1 b \widetilde{\chi}_1^0$ simplified model, $\widetilde{b}_1 \rightarrow b \widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} = 60$ GeV, $m_{\widetilde{b}_1} < 900$ GeV
>1190	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow \widetilde{t}_1 t \widetilde{\chi}_1^0$ simplified model, $\widetilde{t}_1 \rightarrow t \widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0} = 60$ GeV, $m_{\widetilde{t}_1} < 1000$ GeV
>1180	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow \widetilde{t}_1 t \widetilde{\chi}_1^0$ simplified model, $\widetilde{t}_1 \rightarrow b \widetilde{\chi}_1^{\pm}$, $m_{\widetilde{\chi}_1^{\pm}}=2m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0}$=60 GeV, $m_{\widetilde{t}_1}$<1000 GeV
>1250	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow b \overline{b} \widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0} < 400$ GeV
>1340	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not\!\!E_T$, $\widetilde{g} \rightarrow t \overline{t} \widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0} < 400$ GeV

>1300	95	[96] AAD	14AX	ATLS	≥ 3 b-jets + $\not{E}_T$, $\widetilde{g} \to t\overline{b}\widetilde{\chi}_1^{\pm}$ simplified model, $\widetilde{\chi}_1^{\pm} \to f f' \widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^{\pm}} - m_{\widetilde{\chi}_1^0}$ = 2 GeV, $m_{\widetilde{\chi}_1^0}$ < 300 GeV
> 950	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$ simplified model
>1000	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to t\widetilde{t}_1$ with $\widetilde{t}_1 \to b\widetilde{\chi}_1^{\pm}$ simplified model, $m_{\widetilde{t}_1}$ < 200 GeV, $m_{\widetilde{\chi}_1^{\pm}}$ = 118 GeV, $m_{\widetilde{\chi}_1^0}$ = 60 GeV
> 640	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to t\widetilde{t}_1$ with $\widetilde{t}_1 \to c\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{t}_1} = m_{\widetilde{\chi}_1^0}$ + 20 GeV
> 860	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to q q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{(*)\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}} = 2\, m_{\widetilde{\chi}_1^0}$, $m_{\widetilde{\chi}_1^0}$ < 400 GeV
>1040	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to q q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{(*)\pm}\widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \to Z^{(*)}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^0}$ < 520 GeV
>1200	95	[97] AAD	14E	ATLS	$\ell^{\pm}\ell^{\pm}(\ell^{\mp})$ + jets, $\widetilde{g} \to q q' \widetilde{\chi}_1^{\pm}/\widetilde{\chi}_2^0$, $\widetilde{\chi}_1^{\pm} \to \ell^{\pm}\nu\widetilde{\chi}_1^0$, $\widetilde{\chi}_2^0 \to \ell^{\pm}\ell^{\mp}(\nu\nu)\widetilde{\chi}_1^0$ simplified model
>1050	95	[98] CHATRCHYAN	14H	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, $\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$ simplified model, massless $\widetilde{\chi}_1^0$
> 900	95	[99] CHATRCHYAN	14H	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, $\widetilde{g} \to q q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}} = 0.5\, m_{\widetilde{g}}$, massless $\widetilde{\chi}_1^0$
>1050	95	[100] CHATRCHYAN	14H	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, $\widetilde{g} \to b\overline{t}\widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \to W^{\pm}\widetilde{\chi}_1^0$ simplified model, $m_{\widetilde{\chi}_1^{\pm}}$ = 300 GeV, $m_{\widetilde{\chi}_1^0}$ = 50 GeV

[1] AAD 20AL searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with 8 or more jets and moderate missing transverse momentum. The selection makes requirements according to the number of b-tagged jets and the scalar sum of masses of large-radius jets. No significant excess above the Standard Model expectations is observed. Limits up to about 2 TeV are set on the gluino mass in Tglu1E simplified model. Limits up to about 1.8 TeV are set on the gluino mass in Tglu3A simplified model. See their Fig. 10(a).

[2] AAD 20V searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in final states with same-sign charged leptons (electrons or muons) and jets. No significant excess over the Standard Model expectation is observed. In the Tglu1E model, considering off-shell intermediate W and Z bosons in the decay chains, gluino masses are excluded at 95% C.L. up to 1600 GeV for neutralino masses of 100 GeV or above (up to 1000 GeV). See their Fig. 7(a).

[3] SIRUNYAN 20B searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one photon and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on chargino masses in a general gauge-mediated SUSY breaking (GGM) scenario Tchi1n12-GGM, see Figure 4. Limits are also set on the NLSP mass in the Tchi1chi1F and Tchi1chi1G simplified models, see their Figure 5. Finally, limits are set on the gluino mass in the Tglu4A simplified model, see Figure 6.

[4] SIRUNYAN 20BJ searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two hadronically decaying, highly energetic Z bosons and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1H simplified model, see their Figure 9.

[5] SIRUNYAN 20E searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with a single electron or muon and multiple jets, including at least one identified as originating from a b-quark, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A simplified model, see their Fig. 10, and the Tglu3C simplified model, see their Fig. 11.

[6] SIRUNYAN 20T searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least two jets, and two isolated same-sign or three or more charged leptons (electrons or muons). No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figure 7, and in the Tglu1C and Tglu1B simplified models, see their Figures 8 and 9. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 10, and on the stop mass in the Tstop7 simplified model, see their Figure 11. Finally, limits are set on the gluino mass in RPV simplified models where the gluino decays either via $\widetilde{g} \rightarrow q q \overline{q} \overline{q} + e/\mu/\tau$ or via $\widetilde{g} \rightarrow t b s$, see Figure 12.

[7] AABOUD 19I searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in final states with hadronic jets, 1 or two hadronically decaying τ and $\not{E}_T$. In Tglu1F, gluino masses are excluded at 95% C.L. up to 2000 GeV for neutralino masses of 100 GeV or below. Neutralino masses up to 1000 GeV are excluded for all gluino masses below 1400 GeV. See their Fig. 9. Limits are also presented in the context of Gauge-Mediated Symmetry Breaking models: in this case, values of Λ below 110 TeV are excluded at the 95% CL for all values of tanβ in the range 2 < tanβ < 60, see their Fig 10.

[8] SIRUNYAN 19AG searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two photons and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4B simplified model and on the squark mass in the Tsqk4B simplified model, see their Figure 3.

[9] SIRUNYAN 19AU searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at last one photon, jets, some of which are identified as originating from b-quarks, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the gluino mass in the Tglu4C, Tglu4D and Tglu4E simplified models, and on the top squark mass in the Tstop13 simplified model, see their Figure 5.

[10] SIRUNYAN 19CE searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for new particles decaying to a photon and two gluons in events with at least three large-radius jets of which two have substructure and are composed of a photon and two gluons. No statistically significant excess is observed above the SM background expectation. Upper limits at 95% confidence level on the cross section for gluino pair production are set, using a simplified Tglu1A-like stealth SUSY model. Gluino masses up to 1500-1700 GeV are excluded, depending on the neutralino mass, with the highest exclusion set for $m_{\widetilde{\chi}^0_1}$ = 200 GeV. See their Fig 4.

[11] SIRUNYAN 19CH searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing multiple jets and large $\not{E}_T$. No significant excess above the Standard Model

expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A and Tglu3A simplified models, see their Figure 13. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 simplified models, see their Figure 14.

[12] SIRUNYAN 19K searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with a photon, an electron or muon, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. In the framework of GMSB, limits are set on the chargino and neutralino mass in the Tchi1n1A simplified model, see their Figure 6. Limits are also set on the gluino mass in the Tglu4A simplified model, and on the squark mass in the Tsqk4A simplified model, see their Figure 7.

[13] SIRUNYAN 19S searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with zero or one charged leptons, jets and $\not{E}_T$. The razor variables (M_R and R^2) are used to categorize the events. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu3C simplified models, see Figures 22 and 23, and on the stop mass in the Tstop1 simplified model, see their Figure 24.

[14] AABOUD 18AR searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for gluino pair production in events containing large missing transverse momentum and several energetic jets, at least three of which must be identified as originating from b-quarks. No excess is found above the predicted background. In Tglu3A models, gluino masses of less than 1.97 TeV are excluded for $m_{\widetilde{\chi}_1^0}$ below 300 GeV, see their Fig. 10(a). Interpretations are also provided for scenarios where Tglu3A modes mix with Tglu2A and Tglu3D, see their Fig 11.

[15] AABOUD 18AR searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for gluino pair production in events containing large missing transverse momentum and several energetic jets, at least three of which must be identified as originating from b-quarks. No excess is found above the predicted background. In Tglu2A models, gluino masses of less than 1.92 TeV are excluded for $m_{\widetilde{\chi}_1^0}$ below 600 GeV, see their Fig. 10(b). Interpretations are also provided for scenarios where Tglu2A modes mix with Tglu3A and Tglu3D, see their Fig 11.

[16] AABOUD 18AS searched for in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for gluino pair production in the context of AMSB or phenomenological MSSM scenarios with wino-like LSP and long-lived charginos. Events with a disappearing track due to a low-momentum pion accompanied by at least four jets are considered. No significant excess above the Standard Model expectations is observed. Exclusion limits are set at 95% confidence level on the mass of gluinos for different chargino lifetimes. Gluino masses up to 1.65 TeV are excluded assuming a chargino mass of 460 GeV and lifetime of 0.2 ns, corresponding to a mass-splitting between the charged and neutral wino of around 160 MeV. See their Fig. 9.

[17] AABOUD 18BJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with two opposite-sign charged leptons (electrons and muons), jets and missing transverse momentum, with various requirements to be sensitive to signals with different kinematic endpoint values in the dilepton invariant mass distribution. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1G model: gluino masses below 1850 GeV are excluded for $m_{\widetilde{\chi}_1^0}$ = 100 GeV, see their Fig. 12(a).

[18] AABOUD 18BJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with two opposite-sign charged leptons (electrons and muons), jets and missing transverse momentum, with various requirements to be sensitive to signals with different kinematic endpoint values in the dilepton invariant mass distribution. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1H model: gluino masses below 1650 GeV are excluded for $m_{\widetilde{\chi}_1^0}$ = 100 GeV, see their Fig. 13(a).

[19] AABOUD 18U searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with at least one isolated photon, possibly jets and significant transverse momentum targeting generalised models of gauge-mediated SUSY breaking. No significant excess of events is observed above the SM prediction. Results for the di-photon channel are interpreted in

terms of lower limits on the masses of gluinos in Tglu4B models, which reach as high as 2.3 TeV. Gluinos with masses below 2.15 TeV are excluded for any NLSP mass, see their Fig. 8.

[20] AABOUD 18U searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with at least one isolated photon, possibly jets and significant transverse momentum targeting generalised models of gauge-mediated SUSY breaking. No significant excess of events is observed above the SM prediction. Results of the γ + jets + $\not{E}_T$ channel are interpreted in terms of lower limits on the masses of gluinos in GGM higgsino-bino models (mix of Tglu4B and Tglu4C), which reach as high as 2050 GeV. Gluino masses below 1600 GeV are excluded for any NLSP mass provided that $m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0} > 50$ GeV. See their Fig. 11.

[21] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1A model: gluino masses below 2030 GeV are excluded for massless LSP, see their Fig. 13(b).

[22] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1B model. Assuming that $m_{\widetilde{\chi}_1^\pm}$ = 0.5 ($m_{\widetilde{g}}$ + $m_{\widetilde{\chi}_1^0}$), gluino masses below 1980 GeV are excluded for massless LSP, see their Fig. 14(c). Exclusions are also shown assuming $m_{\widetilde{\chi}_1^0}$ = 60 GeV, see their Fig. 14(d).

[23] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1E model: gluino masses below 1750 GeV are excluded for $m_{\widetilde{\chi}_1^0}$ = 1 GeV and any $m_{\widetilde{\chi}_2^0}$ above 100 GeV, see their Fig. 15. Gluino mass exclusion up to 2 TeV is found for $m_{\widetilde{\chi}_2^0}$ = 1 TeV.

[24] SIRUNYAN 18AA searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least one photon and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on wino masses in a general gauge-mediated SUSY breaking (GGM) scenario with bino-like $\widetilde{\chi}_1^0$ and wino-like $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_2^0$, see Figure 7. Limits are also set on the NLSP mass in the Tchi1n1A and Tchi1chi1A simplified models, see their Figure 8. Finally, limits are set on the gluino mass in the Tglu4A and Tglu4B simplified models, see their Figure 9, and on the squark mass in the Tskq4A and Tsqk4B simplified models, see their Figure 10.

[25] SIRUNYAN 18AC searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with a single electron or muon and multiple jets. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1B simplified models, see their Figure 5.

[26] SIRUNYAN 18AL searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least three charged leptons, in any combination of electrons and muons, jets and significant $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1C simplified models, see their Figure 5. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 6, and on the stop mass in the Tstop7 simplified model, see their Figure 7.

[27] SIRUNYAN 18AR searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing two opposite-charge, same-flavour leptons (electrons or muons), jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4C simplified model, see their Figure 7. Limits are also set on the chargino/neutralino mass in the Tchi1n2F simplified models, see their Figure 8, and on the higgsino mass in the Tn1n1B and Tn1n1C simplified models, see their Figure 9. Finally, limits are set on the sbottom mass in the Tsbot3 simplified model, see their Figure 10.

[28] SIRUNYAN 18AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing one or more jets and significant $\not{E}_T$. No significant excess above the Standard

Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see their Figure 3. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 and Tstop4 simplified models, see their Figure 3. Finally, limits are set on long-lived gluino masses in a Tglu1A simplified model where the gluino is metastable or long-lived with proper decay lengths in the range 10^{-3} mm $< c\tau < 10^{5}$ mm, see their Figure 4.

[29] SIRUNYAN 18D searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events containing identified hadronically decaying top quarks, no leptons, and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 simplified model, see their Figure 8, and on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3E simplified models, see their Figure 9.

[30] SIRUNYAN 18M searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one or more high-momentum Higgs bosons, decaying to pairs of b-quarks, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1I and Tglu1J simplified models, see their Figure 3.

[31] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.75 TeV are set on the gluino mass in Tglu3A simplified models in case of off-shell top squarks and for $m_{\widetilde{\chi}_1^0} = 100$ GeV. See their Figure 4(a).

[32] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.57 TeV are set on the gluino mass in Tglu1E simplified models (2-step models) for $m_{\widetilde{\chi}_1^0} = 100$ GeV. See their Figure 4(b).

[33] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.86 TeV are set on the gluino mass in Tglu1G simplified models for $m_{\widetilde{\chi}_1^0} = 200$ GeV. See their Figure 4(c).

[34] AABOUD 17AR searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one isolated lepton, at least two jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 2.1 TeV are set on the gluino mass in Tglu1B simplified models, with $x = (m_{\widetilde{\chi}_1^\pm} - m_{\widetilde{\chi}_1^0}) / (m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0}) = 1/2$.Similar limits are obtained for variable x and fixed neutralino mass, $m_{\widetilde{\chi}_1^0} = 60$ GeV. See their Figure 13.

[35] AABOUD 17AR searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with one isolated lepton, at least two jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.74 TeV are set on the gluino mass in Tglu1E simplified model. Limits up to 1.7 TeV are also set on pMSSM models leading to similar signal event topologies. See their Figure 13.

[36] AABOUD 17AY searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least four jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.8 TeV are set on the gluino mass in Tglu3A simplified models assuming $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0} = 5$ GeV. See their Figure 13.

[37] AABOUD 17AZ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with at least seven jets and large missing transverse momentum. Selected events are further classified based on the presence of large R-jets or b-jets and no leptons. No significant excess above the Standard Model expectations is observed. Limits up to 1.8 TeV are set on the gluino mass in Tglu1E simplified models. See their Figure 6b.

[38] AABOUD 17AZ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least seven jets and large missing transverse momentum. Selected events are further classified based on the presence of large R-jets or b-jets and no leptons. No significant excess above the Standard Model expectations is observed. Limits up to 1.54 TeV are set on the gluino mass in Tglu3A simplified models. See their Figure 7a.

[39] AABOUD 17N searched in 14.7 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with 2 same-flavor, opposite-sign leptons (electrons or muons), jets and large missing transverse momentum. In Tglu1J models, gluino masses are excluded at 95% C.L. up to 1300 GeV for $m_{\widetilde{\chi}_1^0}=0$ GeV and $m_{\widetilde{\chi}_2^0}=1100$ GeV. See their Fig. 12 for exclusion limits as a function of $m_{\widetilde{\chi}_2^0}$. Limits are also presented assuming $m_{\widetilde{\chi}_2^0}=m_{\widetilde{\chi}_1^0}+100$ GeV, see their Fig. 13.

[40] AABOUD 17N searched in 14.7 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with 2 same-flavor, opposite-sign leptons (electrons or muons), jets and large missing transverse momentum. In Tglu1H models, gluino masses are excluded at 95% C.L. up to 1310 GeV for $m_{\widetilde{\chi}_1^0}<400$ GeV and assuming $m_{\widetilde{\chi}_2^0}=(m_{\widetilde{g}}+m_{\widetilde{\chi}_1^0})/2$. See their Fig. 15.

[41] AABOUD 17N searched in 14.7 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with 2 same-flavor, opposite-sign leptons (electrons or muons), jets and large missing transverse momentum. In Tglu1G models, gluino masses are excluded at 95% C.L. up to 1700 GeV for small $m_{\widetilde{\chi}_1^0}$. The results probe kinematic endpoints as small as $m_{\widetilde{\chi}_2^0}-m_{\widetilde{\chi}_1^0}=(m_{\widetilde{g}}-m_{\widetilde{\chi}_1^0})/2=50$ GeV. See their Fig. 14.

[42] KHACHATRYAN 17 searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing four or more jets, no more than one lepton, and missing transverse momentum, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No evidence for an excess over the expected background is observed. Limits are derived on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see Figs. 16 and 17. Also, assuming gluinos decay only via three-body processes involving third-generation quarks plus a neutralino/chargino, and assuming $m_{\widetilde{\chi}_1^\pm}=m_{\widetilde{\chi}_1^0}+5$ GeV, a branching ratio-independent limit on the gluino mass is given, see Fig. 16.

[43] KHACHATRYAN 17AD searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing at least four jets (including b-jets), missing transverse momentum and tagged top quarks. No evidence for an excess over the expected background is observed. Gluino masses up to 1550 GeV and neutralino masses up to 900 GeV are excluded at 95% C.L. See Fig. 13.

[44] KHACHATRYAN 17AD searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing at least four jets (including b-jets), missing transverse momentum and tagged top quarks. No evidence for an excess over the expected background is observed. Gluino masses up to 1450 GeV and neutralino masses up to 820 GeV are excluded at 95% C.L. See Fig. 13.

[45] KHACHATRYAN 17AS searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with a single electron or muon and multiple jets. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1B simplified models, see their Fig. 7.

[46] KHACHATRYAN 17AW searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least three charged leptons, in any combination of electrons and muons, and significant $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu1C simplified models, and on the sbottom mass in the Tsbot2 simplified model, see their Figure 4.

[47] KHACHATRYAN 17P searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figures 7 and 8. Limits are also set on the squark mass in the Tsqk1 simplified model, see their Fig. 7, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 8. Finally, limits are set on

the stop mass in the Tstop1, Tstop3, Tstop4, Tstop6 and Tstop7 simplified models, see Fig. 8.

[48] KHACHATRYAN 17V searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two photons and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino and squark mass in the context of general gauge mediation models Tglu4B and Tsqk4, see their Fig. 4.

[49] SIRUNYAN 17AF searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with a single lepton (electron or muon), jets, including at least one jet originating from a b-quark, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A and Tglu3B simplified models, see their Figure 2.

[50] SIRUNYAN 17AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least one photon, jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu4A and Tglu4B simplified models, and on the squark mass in the Tskq4A and Tsqk4B simplified models, see their Figure 6.

[51] SIRUNYAN 17AZ searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A, Tglu3A simplified models, see their Figures 6. Limits are also set on the squark mass in the Tsqk1 simplified model (for single light squark and for 8 degenerate light squarks), on the sbottom mass in the Tsbot1 simplified model and on the stop mass in the Tstop1 simplified model, see their Fig. 7. Finally, limits are set on the stop mass in the Tstop2, Tstop4 and Tstop8 simplified models, see Fig. 8.

[52] SIRUNYAN 17P searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with multiple jets and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A, Tglu3A and Tglu3D simplified models, see their Fig. 12. Limits are also set on the squark mass in the Tsqk1 simplified model, on the stop mass in the Tstop1 simplified model, and on the sbottom mass in the Tsbot1 simplified model, see Fig. 13.

[53] SIRUNYAN 17S searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two isolated same-sign leptons, jets, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the mass of the gluino mass in the Tglu3A, Tglu3B, Tglu3C, Tglu3D and Tglu1B simplified models, see their Figures 5 and 6, and on the sbottom mass in the Tsbot2 simplified model, see their Figure 6.

[54] AABOUD 16AC searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with hadronic jets, 1 or two hadronically decaying τ and $\not{E}_T$. In Tglu1F, gluino masses are excluded at 95% C.L. up to 1570 GeV for neutralino masses of 100 GeV or below. Neutralino masses up to 700 GeV are excluded for all gluino masses between 800 GeV and 1500 GeV, while the strongest neutralino-mass exclusion of 750 GeV is achieved for gluino masses around 1400 GeV. See their Fig. 8. Limits are also presented in the context of Gauge-Mediated Symmetry Breaking models: in this case, values of Λ below 92 TeV are excluded at the 95% CL, corresponding to gluino masses below 2000 GeV. See their Fig. 9.

[55] AABOUD 16J searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with one isolated electron or muon, hadronic jets, and $\not{E}_T$. Gluino-mediated pair production of stops with a nearly mass-degenerate stop and neutralino are targeted and gluino masses are excluded at 95% C.L. up to 1460 GeV. A 100% of stops decaying via charm + neutralino is assumed. The results are also valid in case of 4-body decays $\widetilde{t}_1 \rightarrow f f' b \widetilde{\chi}^0_1$. See their Fig. 8.

[56] AABOUD 16M searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two photons, hadronic jets and $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on gluino masses in the general gauge-mediated SUSY breaking model (GGM), for bino-like NLSP. See their Fig. 3.

[57] AABOUD 16N searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing hadronic jets, large $\not{E}_T$, and no electrons or muons. No significant excess above the

Standard Model expectations is observed. Gluino masses below 1510 GeV are excluded at the 95% C.L. in a simplified model with only gluinos and the lightest neutralino. See their Fig. 7b.

[58] AABOUD 16N searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing hadronic jets, large $\not{E}_T$, and no electrons or muons. No significant excess above the Standard Model expectations is observed. Gluino masses below 1500 GeV are excluded at the 95% C.L. in a simplified model with gluinos decaying via an intermediate $\widetilde{\chi}_1^{\pm}$ to two quarks, a W boson and a $\widetilde{\chi}_1^0$, for $m_{\widetilde{\chi}_1^0}=200$ GeV. See their Fig 8.

[59] AAD 16AD searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing several energetic jets, of which at least three must be identified as b-jets, large $\not{E}_T$ and no electrons or muons. No significant excess above the Standard Model expectations is observed. For $\widetilde{\chi}_1^0$ below 800 GeV, gluino masses below 1780 GeV are excluded at 95% C.L. for gluinos decaying via bottom squarks. See their Fig. 7a.

[60] AAD 16AD searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events containing several energetic jets, of which at least three must be identified as b-jets, large $\not{E}_T$ and one electron or muon. Large-radius jets with a high mass are also used to identify highly boosted top quarks. No significant excess above the Standard Model expectations is observed. For $\widetilde{\chi}_1^0$ below 700 GeV, gluino masses below 1760 GeV are excluded at 95% C.L. for gluinos decaying via top squarks. See their Fig. 7b.

[61] AAD 16BB searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with exactly two same-sign leptons or at least three leptons, multiple hadronic jets, b-jets, and $\not{E}_T$. No significant excess over the Standard Model expectation is found. Exclusion limits at 95% C.L. are set on the gluino mass in various simplified models (Tglu1D, Tglu1E, Tglu3A). See their Figs. 4.a, 4.b, and 4.d.

[62] AAD 16BG searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV in final states with one isolated electron or muon, hadronic jets, and $\not{E}_T$. The data agree with the SM background expectation in the six signal selections defined in the search, and the largest deviation is a 2.1 standard deviation excess. Gluinos are excluded at 95% C.L. up to 1600 GeV assuming they decay via the lightest chargino to the lightest neutralino as in the model Tglu1B for $m_{\widetilde{\chi}_1^0}$=100 GeV, assuming $m_{\widetilde{\chi}_1^{\pm}}$=($m_{\widetilde{g}}$ + $m_{\widetilde{\chi}_1^0}$)/2. See their Fig. 6.

[63] AAD 16V searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with $\not{E}_T$ various hadronic jet multiplicities from ≥ 7 to ≥ 10 and with various b-jet multiplicity requirements. No significant excess over the Standard Model expectation is found. Exclusion limits at 95% C.L. are set on the gluino mass in one simplified model (Tglu1E) and a pMSSM-inspired model. See their Fig. 5.

[64] KHACHATRYAN 16AM searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with highly boosted W-bosons and b-jets, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3C and Tglu3B simplified models, see Fig. 12.

[65] KHACHATRYAN 16BJ searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the following simplified models: Tglu3A and Tglu3D, see Fig. 4, Tglu3B and Tglu3C, see Fig. 5, and Tglu1B, see Fig. 7.

[66] KHACHATRYAN 16BS searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least one energetic jet , no isolated leptons, and significant $\not{E}_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see Fig. 10 and Table 3.

[67] KHACHATRYAN 16BY searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two opposite-sign, same-flavour leptons, jets, and missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits are set

on the gluino mass in the Tglu4C simplified model, see Fig. 4, and on sbottom masses in the Tsbot3 simplified model, see Fig. 5.

[68] KHACHATRYAN 16V searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least four energetic jets and significant $\not\!\!E_T$, no identified isolated electron or muon or charged track. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu1C, Tglu2A, and Tglu3A simplified models, see Fig. 8.

[69] AAD 15BG searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with jets, missing E_T, and two opposite-sign same flavor isolated leptons featuring either a kinematic edge, or a peak at the Z-boson mass, in the invariant mass spectrum. No evidence for a statistically significant excess over the expected SM backgrounds are observed and 95% C.L. exclusion limits are derived in a GGM simplified model of gluino pair production where the gluino decays into quarks, a Z-boson, and a massless gravitino LSP, see Fig. 12. Also, limits are set in simplified models with slepton/sneutrino intermediate states, see Fig. 13.

[70] AAD 15BV summarized and extended ATLAS searches for gluinos and first- and second-generation squarks in final states containing jets and missing transverse momentum, with or without leptons or b-jets in the $\sqrt{s}$ =8 TeV data set collected in 2012. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on the gluino mass in several R-parity conserving models, leading to a generalized constraint on gluino masses exceeding 1150 GeV for lightest supersymmetric particle masses below 100 GeV. See their Figs. 10, 19, 20, 21, 23, 25, 26, 29-37.

[71] AAD 15BX interpreted the results of a wide range of ATLAS direct searches for supersymmetry, during the first run of the LHC using the $\sqrt{s}$ =7 TeV and $\sqrt{s}=8$ TeV data set collected in 2012, within the wider framework of the phenomenological MSSM (pMSSM). The integrated luminosity was up to 20.3 fb^{-1}. From an initial random sampling of 500 million pMSSM points, generated from the 19-parameter pMSSM, a total of 310,327 model points with $\widetilde{\chi}_1^0$ LSP were selected each of which satisfies constraints from previous collider searches, precision measurements, cold dark matter energy density measurements and direct dark matter searches. The impact of the ATLAS Run 1 searches on this space was presented, considering the fraction of model points surviving, after projection into two-dimensional spaces of sparticle masses. Good complementarity is observed between different ATLAS analyses, with almost all showing regions of unique sensitivity. ATLAS searches have good sensitivity at LSP mass below 800 GeV.

[72] AAD 15CA searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with one or more photons, hadronic jets or b-jets and $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on gluino masses in the general gauge-mediated SUSY breaking model (GGM), for bino-like or higgsino-bino admixtures NLSP, see Fig. 8, 10, 11

[73] KHACHATRYAN 15AF searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with at least two energetic jets and significant $\not\!\!E_T$, using the transverse mass variable M_{T2} to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the decay $\widetilde{g}\rightarrow q\overline{q}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 13(a), or where the decay $\widetilde{g}\rightarrow b\overline{b}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 13(b), or where the decay $\widetilde{g}\rightarrow t\overline{t}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 13(c). See also Table 5. Exclusions in the CMSSM, assuming tan$\beta=30$, $A_0=-2$ max(m_0, $m_{1/2}$) and $\mu>0$, are also presented, see Fig. 15.

[74] KHACHATRYAN 15I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events in which b-jets and four W-bosons are produced. Five individual search channels are combined (fully hadronic, single lepton, same-sign dilepton, opposite-sign dilepton, multilepton). No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in a simplified model where the decay $\widetilde{g}\rightarrow t\overline{t}\widetilde{\chi}_1^0$ takes

place with a branching ratio of 100%, see Fig. 5. Also a simplified model with gluinos decaying into on-shell top squarks is considered, see Fig. 6.

[75] KHACHATRYAN 15X searched in 19.3fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least two energetic jets, at least one of which is required to originate from a b quark, and significant $\not{E}_T$, using the razor variables (M_R) and R^2) to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the decay $\widetilde{g} \rightarrow b\overline{b}\widetilde{\chi}_1^0$ and the decay $\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}_1^0$ take place with branching ratios varying between 0, 50 and 100%, see Figs. 13 and 14.

[76] AAD 14AE searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for strongly produced supersymmetric particles in events containing jets and large missing transverse momentum, and no electrons or muons. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing gluinos and squarks, see Figures 5, 6 and 7. Limits are also derived in the mSUGRA/CMSSM with parameters tanβ = 30, $A_0 = -2\ m_0$ and $\mu > 0$, see their Fig. 8.

[77] AAD 14AG searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing one hadronically decaying τ-lepton, zero or one additional light leptons (electrons or muons), jets and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set in several SUSY scenarios. For an interpretation in the minimal GMSB model, see their Fig. 8. For an interpretation in the mSUGRA/CMSSM with parameters tanβ = 30, $A_0 = -2\ m_0$ and $\mu > 0$, see their Fig. 9. For an interpretation in the framework of natural Gauge Mediation, see Fig. 10. For an interpretation in the bRPV scenario, see their Fig. 11.

[78] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in a general gauge-mediation model (GGM) where the decay $\widetilde{g} \rightarrow q\overline{q}\widetilde{\chi}_1^0$, with $\widetilde{\chi}_1^0 \rightarrow \ell^{\pm}\ell^{\mp}\widetilde{G}$, takes place with a branching ratio of 100%, for two choices of tanβ = 1.5 and 30, see Fig. 11. Also some constraints on the higgsino mass parameter μ are discussed.

[79] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{g} \rightarrow q\overline{q}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 28. Exclusions in the CMSSM, assuming tanβ = 10, A_0 = 0 and $\mu >$ 0, are also presented, see Fig. 26.

[80] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. A second analysis requires at least one of the jets to be originating from a b-quark. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{g} \rightarrow b\overline{b}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Figs. 28 and 29. Exclusions in the CMSSM, assuming tanβ = 10, A_0 = 0 and $\mu > 0$, are also presented, see Fig. 26.

[81] CHATRCHYAN 14AH searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with at least two energetic jets and significant $\not{E}_T$, using the razor variables (M_R and R^2) to discriminate between signal and background processes. A second analysis requires at least one of the jets to be originating from a b-quark. No significant excess above the Standard Model expectations is observed. Limits are set on sbottom masses in simplified models where the decay $\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Figs. 28 and 29. Exclusions in the CMSSM, assuming tanβ = 10, A_0 = 0 and $\mu >$0, are also presented, see Fig. 26.

[82] CHATRCHYAN 14I searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing multijets and large $\not{E}_T$. No excess over the expected SM background is

observed. Exclusion limits are derived in simplified models containing gluinos that decay via $\widetilde{g} \to q\overline{q}\widetilde{\chi}_1^0$ with a 100% branching ratio, see Fig. 7b, or via $\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$ with a 100% branching ratio, see Fig. 7c, or via $\widetilde{g} \to q\overline{q}W/Z\widetilde{\chi}_1^0$, see Fig. 7d.

[83] CHATRCHYAN 14N searched in 19.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing a single isolated electron or muon and multiple jets, at least two of which are identified as originating from a b-quark. No significant excesses over the expected SM backgrounds are observed. The results are interpreted in three simplified models of gluino pair production with subsequent decay into virtual or on-shell top squarks, where each of the top squarks decays in turn into a top quark and a $\widetilde{\chi}_1^0$, see Fig. 4. The models differ in which masses are allowed to vary.

[84] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in a slepton co-NLSP simplified model (GMSB) where the decay $\widetilde{g} \to q\ell^{\pm}\ell^{\mp}\widetilde{G}$ takes place with a branching ratio of 100%, see Fig. 8.

[85] CHATRCHYAN 14R searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least three leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in a simplified model where the decay $\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, see Fig. 11.

[86] AABOUD 18BJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with two opposite-sign charged leptons (electrons and muons), jets and missing transverse momentum, with various requirements to be sensitive to signals with different kinematic endpoint values in the dilepton invariant mass distribution. The data are found to be consistent with the SM expectation. Results are interpreted in the Tglu1H model in case of $m_{\widetilde{\chi}_1^0}$ = 1 GeV: for any $m_{\widetilde{\chi}_2^0}$, gluino masses below 1500 GeV are excluded, see their Fig. 14(a).

[87] AABOUD 18V searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV in events with no charged leptons, jets and missing transverse momentum. The data are found to be consistent with the SM expectation. Results are interpreted in a Tglu1C-like model, assuming 50% BR for each gluino decay mode. Gluino masses below 1770 GeV are excluded for any $m_{\widetilde{\chi}_2^0} - m_{\widetilde{\chi}_1^0}$ and $m_{\widetilde{\chi}_1^0}$ = 60 GeV, see their Fig. 16(b).

[88] AABOUD 17AZ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least seven jets and large missing transverse momentum. Selected events are further classified based on the presence of large R-jets or b-jets and no leptons. No significant excess above the Standard Model expectations is observed. Limits are set for pMSSM models with M_1 = 60 GeV, tan(β) = 10, μ < 0 varying the soft-breaking parameters M_3 and μ. Gluino masses up to 1600 GeV are excluded for $m_{\widetilde{\chi}_1^{\pm}}$ = 200 GeV. See their Figure 6a and text for details on the model.

[89] KHACHATRYAN 16AY searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one isolated high transverse momentum lepton (e or μ), hadronic jets of which at least one is identified as coming from a b-quark, and large $\not{E}_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A simplified model, see Fig. 10, and in the Tglu3B model, see Fig. 11.

[90] KHACHATRYAN 16BT performed a global Bayesian analysis of a wide range of CMS results obtained with data samples corresponding to 5.0 fb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV and in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. The set of searches considered, both individually and in combination, includes those with all-hadronic final states, same-sign and opposite-sign dileptons, and multi-lepton final states. An interpretation was given in a scan of the 19-parameter pMSSM. No scan points with a gluino mass less than 500 GeV survived and 98% of models with a squark mass less than 300 GeV were excluded.

[91] AAD 15AB searched for the decay of neutral, weakly interacting, long-lived particles in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV. Signal events require at least two reconstructed vertices possibly originating from long-lived particles decaying to jets in the inner tracking detector and muon spectrometer. No significant excess of events over the expected background was found. Results were interpreted in Stealth SUSY benchmark models where a pair of gluinos decay to long-lived singlinos, $\widetilde{S}$, which in turn each decay to a low-mass gravitino and a pair of jets. The 95% confidence-level limits are set on the cross section $\times$ branching ratio for the decay $\widetilde{g} \rightarrow \widetilde{S} g$, as a function of the singlino proper lifetime ($c\tau$). See their Fig. 10(f)

[92] AAD 15AI searched in 20 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events containing at least one isolated lepton (electron or muon), jets, and large missing transverse momentum. No excess of events above the expected level of Standard Model background was found. Exclusion limits at 95% C.L. are set on the gluino mass in the CMSSM/mSUGRA, see Fig. 15, in the NUHMG, see Fig. 16, and in various simplified models, see Figs. 18–22.

[93] AAD 15CB searched for events containing at least one long-lived particle that decays at a significant distance from its production point (displaced vertex, DV) into two leptons or into five or more charged particles in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV. The dilepton signature is characterised by DV formed from at least two lepton candidates. Four different final states were considered for the multitrak signature, in which the DV must be accompanied by a high-transverse momentum muon or electron candidate that originates from the DV, jets or missing transverse momentum. No events were observed in any of the signal regions. Results were interpreted in SUSY scenarios involving R-parity violation, split supersymmetry, and gauge mediation. See their Fig. 12–20.

[94] KHACHATRYAN 15AD searched in 19.4 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with two opposite-sign same flavor isolated leptons featuring either a kinematic edge, or a peak at the Z-boson mass, in the invariant mass spectrum. No evidence for a statistically significant excess over the expected SM backgrounds is observed and 95% C.L. exclusion limits are derived in a simplified model of gluino pair production where the gluino decays into quarks, a Z-boson, and a massless gravitino LSP, see Fig. 9.

[95] KHACHATRYAN 15AZ searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with either at least one photon, hadronic jets and $\not{E}_T$ (single photon channel) or with at least two photons and at least one jet and using the razor variables. No significant excess above the Standard Model expectations is observed. Limits are set on gluino masses in the general gauge-mediated SUSY breaking model (GGM), for both a bino-like and wino-like neutralino NLSP scenario, see Fig. 8 and 9.

[96] AAD 14AX searched in 20.1 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for the strong production of supersymmetric particles in events containing either zero or at last one high high-p_T lepton, large missing transverse momentum, high jet multiplicity and at least three jets identified as originating from b-quarks. No excess over the expected SM background is observed. Limits are derived in mSUGRA/CMSSM models with $\tan\beta = 30$, $A_0 = -2m_0$ and $\mu > 0$, see their Fig. 14. Also, exclusion limits in simplified models containing gluinos and scalar top and bottom quarks are set, see their Figures 12, 13.

[97] AAD 14E searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for strongly produced supersymmetric particles in events containing jets and two same-sign leptons or three leptons. The search also utilises jets originating from b-quarks, missing transverse momentum and other variables. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing gluinos and squarks, see Figures 5 and 6. In the $\widetilde{g} \rightarrow q q' \widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow W^{(*)\pm} \widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \rightarrow Z^{(*)} \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^\pm} = 0.5\ m_{\widetilde{\chi}_1^0} + m_{\widetilde{g}}$, $m_{\widetilde{\chi}_2^0} = 0.5\ (m_{\widetilde{\chi}_1^0} + m_{\widetilde{\chi}_1^\pm})$, $m_{\widetilde{\chi}_1^0} < 520$ GeV. In the $\widetilde{g} \rightarrow q q' \widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow \ell^\pm \nu \widetilde{\chi}_1^0$ or $\widetilde{g} \rightarrow q q' \widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \rightarrow \ell^\pm \ell^\mp (\nu\nu) \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^\pm} = m_{\widetilde{\chi}_2^0} = 0.5\ (m_{\widetilde{\chi}_1^0} + m_{\widetilde{g}})$, $m_{\widetilde{\chi}_1^0} < 660$ GeV. Limits are also derived in the mSUGRA/CMSSM, bRPV and GMSB models, see their Fig. 8.

[98] CHATRCHYAN 14H searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the decay $\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, or where the decay $\widetilde{g} \rightarrow \widetilde{t}t$, $\widetilde{t} \rightarrow t\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, with varying mass of the $\widetilde{\chi}_1^0$, or where the decay $\widetilde{g} \rightarrow \widetilde{b}b$, $\widetilde{b} \rightarrow t\widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow W^\pm\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, with varying mass of the $\widetilde{\chi}_1^\pm$, see Fig. 5.

[99] CHATRCHYAN 14H searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the decay $\widetilde{g} \rightarrow qq'\widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow W^\pm\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, with varying mass of the $\widetilde{\chi}_1^\pm$ and $\widetilde{\chi}_1^0$, see Fig. 7.

[100] CHATRCHYAN 14H searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the decay $\widetilde{g} \rightarrow b\overline{t}\widetilde{\chi}_1^\pm$, $\widetilde{\chi}_1^\pm \rightarrow W^\pm\widetilde{\chi}_1^0$ takes place with a branching ratio of 100%, for two choices of $m_{\widetilde{\chi}_1^\pm}$ and fixed $m_{\widetilde{\chi}_1^0}$, see Fig. 6.

R-parity violating heavy $\widetilde{g}$ (Gluino) mass limit

VALUE (GeV)	CL%	DOCUMENT ID		TECN	COMMENT
>1600	95	[1] AAD	20AL	ATLS	8 or more jets+$E\!\!\!/_T$, Tglu2RPV
>1600	95	[2] AAD	20V	ATLS	same-sign $\ell^\pm\ell^\pm$ + jets, $\widetilde{g} \rightarrow tbd$ simplified model
>2150	95	[3] SIRUNYAN	20T	CMS	same-sign $\ell^\pm\ell^\pm$ or $\geq 3\ell^\pm$ + jets, $\widetilde{g} \rightarrow qq\overline{q}\overline{q} + e/\mu/\tau$ simplified model
>1725	95	[3] SIRUNYAN	20T	CMS	same-sign $\ell^\pm\ell^\pm$ or $\geq 3\ell^\pm$+jets, $\widetilde{g} \rightarrow tbs$ simplified model
>1500	95	[4] SIRUNYAN	19F	CMS	$\widetilde{g} \rightarrow jjj$
>2260	95	[5] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{12k} \neq 0$, $m_{\widetilde{\chi}_1^0} > 1000$ GeV
>1650	95	[5] AABOUD	18Z	ATLS	$\geq 4\ell$, $\lambda_{i33} \neq 0$, $m_{\widetilde{\chi}_1^0} > 500$ GeV
>1610	95	[6] SIRUNYAN	18AK	CMS	$\widetilde{g} \rightarrow tbs$, λ''_{332} coupling
>1690	95	[7] SIRUNYAN	18D	CMS	top quark (hadronically decaying) + jets + $E\!\!\!/_T$, Tglu3C, $m_{\widetilde{t}_1} - m_{\widetilde{\chi}_1^0}$ = 20 GeV, $m_{\widetilde{\chi}_1^0}$ = 0 GeV
none 100–1410	95	[8] SIRUNYAN	18EA	CMS	2 large jets with four-parton substructure, $\widetilde{g} \rightarrow 5q$
>2100	95	[9] AABOUD	17AI	ATLS	$\geq 1\ell + \geq 8$ jets, Tglu3A and $\widetilde{\chi}_1^0 \rightarrow uds$, λ''_{112} coupling, $m_{\widetilde{\chi}_1^0}$=1000 GeV
>1650	95	[10] AABOUD	17AI	ATLS	$\geq 1\ell + \geq 8$ jets, $\widetilde{g} \rightarrow t\widetilde{t}$, $\widetilde{t} \rightarrow bs$, λ''_{323} coupling, $m_{\widetilde{t}}$=1000 GeV
>1800	95	[11] AABOUD	17AI	ATLS	$\geq 1\ell + \geq 8$ jets, Tglu1A and $\widetilde{\chi}_1^0 \rightarrow qql$, λ' coupling, $m_{\widetilde{\chi}_1^0}$=1000 GeV

>1800	95	[12] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not{E}_T$, Tglu3A, λ''_{112} coupling, $m_{\widetilde{\chi}^0_1}$ = 50 GeV
>1750	95	[13] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not{E}_T$, Tglu1A and $\widetilde{\chi}^0_1 \rightarrow q q \ell$, λ' coupling
>1450	95	[14] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not{E}_T$, $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow s d$, λ''_{321} coupling
>1450	95	[15] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not{E}_T$, $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow b d$, λ''_{313} coupling
>400	95	[16] AABOUD	17AJ	ATLS	same-sign $\ell^{\pm}\ell^{\pm}$ / 3 ℓ + jets + $\not{E}_T$, $\widetilde{d}_R \rightarrow t b (t s)$, λ''_{313} (λ''_{321}) coupling
none 625–1375	95	[17] AABOUD	17AZ	ATLS	$\geq$ 7 jets+$\not{E}_T$, large R-jets and/or b-jets, $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow b s$, λ''_{323} coupling
none 600–650	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q q q$, λ''_{212} coupling, $m_{\widetilde{q}}$ = 100 GeV
none 600–1030	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q q q$, λ''_{212} coupling, $m_{\widetilde{q}}$ = 900 GeV
none 600–650	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q q b$, λ''_{213} coupling, $m_{\widetilde{q}}$ = 100 GeV
none 600–1080	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q q b$, λ''_{213} coupling, $m_{\widetilde{q}}$ = 900 GeV
none 600–680	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q b b$, λ''_{212} coupling, $m_{\widetilde{q}}$ = 100 GeV
none 600–1080	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q q b b$, λ''_{212} coupling, $m_{\widetilde{q}}$ = 900 GeV
none 600–650	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q b b b$, λ''_{213} coupling, $m_{\widetilde{q}}$ = 100 GeV
none 600–1100	95	[18] KHACHATRY...	17Y	CMS	$\widetilde{g} \rightarrow q q b b b$, λ''_{213} coupling, $m_{\widetilde{q}}$ = 900 GeV
>1050	95	[19] KHACHATRY...	16BJ	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, Tglu3A, $m_{\widetilde{\chi}^0_1}$ < 800 GeV
>1140	95	[19] KHACHATRY...	16BJ	CMS	same-sign $\ell^{\pm}\ell^{\pm}$, Tglu3B, $m_{\widetilde{t}} - m_{\widetilde{\chi}^0_1}$ = 20 GeV, $m_{\widetilde{\chi}^0_1}$ = 0
>1030	95	[20] KHACHATRY...	16BX	CMS	$\widetilde{g} \rightarrow t b s$, λ''_{332} coupling
>1150	95	[21] AAD	15BV	ATLS	general RPC $\widetilde{g}$ decays, $m_{\widetilde{\chi}^0_1}$ < 100 GeV
>1350	95	[22] AAD	14X	ATLS	$\geq 4\ell^{\pm}$, $\widetilde{g} \rightarrow q \overline{q} \widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \rightarrow \ell^{\pm}\ell^{\mp}\nu$
>650	95	[23] CHATRCHYAN	14P	CMS	$\widetilde{g} \rightarrow j j j$
none 200–835	95	[23] CHATRCHYAN	14P	CMS	$\widetilde{g} \rightarrow b j j$

• • • We do not use the following data for averages, fits, limits, etc. • • •

>1875	95	[24] AABOUD	18CF	ATLS	jets and large R-jets, Tglu2RPV and $\widetilde{\chi}^0_1 \rightarrow qqq$, λ'' coupling, $m_{\widetilde{\chi}^0_1}$=1000 GeV
>1400	95	[25] KHACHATRY...	16BX	CMS	$\widetilde{g} \rightarrow qq\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \rightarrow \ell\ell\nu$, λ_{121} or $\lambda_{122} \neq 0$, $m_{\widetilde{\chi}^0_1} > 400$ GeV
>1600	95	[21] AAD	15BV	ATLS	pMSSM, $M_1 = 60$ GeV, $m_{\widetilde{q}} < 1500$ GeV
>1280	95	[21] AAD	15BV	ATLS	mSUGRA, $m_0 > 2$ TeV
>1100	95	[21] AAD	15BV	ATLS	via $\widetilde{\tau}$, natural GMSB, all $m_{\widetilde{\tau}}$
>1220	95	[21] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow t\widetilde{\chi}^0_1$, $m_{T_1} < 1000$ GeV
>1180	95	[21] AAD	15BV	ATLS	b-jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^\pm_1$, $m_{T_1} < 1000$ GeV, $m_{\widetilde{\chi}^0_1} = 60$ GeV
> 880	95	[21] AAD	15BV	ATLS	jets, $\widetilde{g} \rightarrow \widetilde{t}_1 t$ and $\widetilde{t}_1 \rightarrow sb$, $400 < m_{\widetilde{t}_1} < 1000$ GeV
		[26] AAD	15CB	ATLS	ℓ, $\widetilde{g} \rightarrow (e/\mu)qq$, benchmark gluino, neutralino masses
> 600	95	[26] AAD	15CB	ATLS	$\ell\ell/Z$, $\widetilde{g} \rightarrow (ee/\mu\mu/e\mu)qq$, $m_{\widetilde{\chi}^0_1} = 400$ GeV and $0.7 < c\tau_{\widetilde{\chi}^0_1} < 3 \times 10^5$ mm
>1000	95	[27] AAD	15X	ATLS	≥ 10 jets, $\widetilde{g} \rightarrow q\overline{q}\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_1 \rightarrow qqq$, $m_{\widetilde{\chi}^0_1}$=500 GeV
> 917	95	[27] AAD	15X	ATLS	$\geq$ 6,7 jets, $\widetilde{g} \rightarrow qqq$, (light-quark, λ'' couplings)
> 929	95	[27] AAD	15X	ATLS	$\geq$ 6,7 jets, $\widetilde{g} \rightarrow qqq$, (b-quark, λ'' couplings)
>1180	95	[28] AAD	14AX	ATLS	≥ 3 b-jets + $\not{E}_T$, $\widetilde{g} \rightarrow \widetilde{t}_1 t\widetilde{\chi}^0_1$ simplified model, $\widetilde{t}_1 \rightarrow b\widetilde{\chi}^\pm_1$, $m_{\widetilde{\chi}^\pm_1}=2m_{\widetilde{\chi}^0_1}$, $m_{\widetilde{\chi}^0_1}$=60 GeV, $m_{\widetilde{t}_1}$<1000 GeV
> 850	95	[29] AAD	14E	ATLS	$\ell^\pm\ell^\pm(\ell^\mp)$ + jets, $\widetilde{g} \rightarrow t\widetilde{t}_1$ with $\widetilde{t}_1 \rightarrow bs$ simplified model
> 900	95	[30] CHATRCHYAN	14H	CMS	same-sign $\ell^\pm\ell^\pm$, $\widetilde{g} \rightarrow tbs$ simplified model

[1] AAD 20AL searched in 139 fb^{-1} of pp collisions at $\sqrt{s} = 13$ TeV for events with 8 or more jets and moderate missing transverse momentum. The selection makes requirements according to the number of b-tagged jets and the scalar sum of masses of large-radius jets. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on the gluino mass in RPV simplified models where the gluino decays via $\widetilde{g} \rightarrow tbd$ or $\widetilde{g} \rightarrow tbs$. They extend up to almost 1.6 TeV for a $\widetilde{t}_1$ mass of 900 GeV. See their Fig. 10(c).

[2] AAD 20V searched in 139 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with two same-sign charged leptons (electrons or muons) and jets. No significant excess above the Standard Model expectations is observed. Exclusion limits at 95% C.L. are set on the gluino mass in RPV simplified models where the gluino decays via $\widetilde{g} \rightarrow t b d$, see Figure 7(b).

[3] SIRUNYAN 20T searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with at least two jets, and two isolated same-sign or three or more charged leptons (electrons or muons). No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3D simplified models, see their Figure 7, and in the Tglu1C and Tglu1B simplified models, see their Figures 8 and 9. Limits are also set on the sbottom mass in the Tsbot2 simplified model, see their Figure 10, and on the stop mass in the Tstop7 simplified model, see their Figure 11. Finally, limits are set on the gluino mass in RPV simplified models where the gluino decays either via $\widetilde{g} \rightarrow q q \overline{q} \overline{q} + e/\mu/\tau$ or via $\widetilde{g} \rightarrow t b s$, see Figure 12.

[4] SIRUNYAN 19F searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for three-jet resonances produced in the decay of a gluino in R-parity violating supersymmetric models. The mass range from 200 to 2000GeV is explored in four separate mass regions. The observations show agreement with standard model expectations. The results are interpreted within the framework of R-parity violating SUSY, where pair-produced gluinos decay to a six quark final state. Gluino masses below 1500GeV are excluded at 95% C.L. See their Fig.5.

[5] AABOUD 18Z searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing four or more charged leptons (electrons, muons and up to two hadronically decaying taus). No significant deviation from the expected SM background is observed. Limits are set on the Higgsino mass in simplified models of general gauge mediated supersymmetry Tn1n1A/Tn1n1B/Tn1n1C, see their Figure 9. Limits are also set on the wino, slepton, sneutrino and gluino mass in a simplified model of NLSP pair production with R-parity violating decays of the LSP via λ_{12k} or λ_{i33} to charged leptons, see their Figures 7, 8.

[6] SIRUNYAN 18AK searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing a single lepton, large jet and b-quark jet multiplicities, coming from R-parity-violating decays of gluinos. No excess over the expected background is observed. Limits are derived on the gluino mass, assuming the RPV $\widetilde{g} \rightarrow t b s$ decay, see their Figure 9.

[7] SIRUNYAN 18D searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing identified hadronically decaying top quarks, no leptons, and $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the stop mass in the Tstop1 simplified model, see their Figure 8, and on the gluino mass in the Tglu3A, Tglu3B, Tglu3C and Tglu3E simplified models, see their Figure 9.

[8] SIRUNYAN 18EA searched in 38.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for the pair production of resonances, each decaying to at least four quarks. Reconstructed particles are clustered into two large jets of similar mass, each consistent with four-parton substructure. No statistically significant excess over the Standard Model expectation is observed. Limits are set on the squark and gluino mass in RPV supersymmetry models where squarks (gluinos) decay, through intermediate higgsinos, to four (five) quarks, see their Figure 4.

[9] AABOUD 17AI searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more isolated lepton, at least eight jets, either zero or many b-jets, for evidence of R-parity violating decays of the gluino. No significant excess above the Standard Model expectations is observed. Limits up to 2.1 TeV are set on the gluino mass in R-parity-violating supersymmetry models as Tglu3A with LSP decay through the non-zero λ''_{112} coupling as $\widetilde{\chi}^0_1 \rightarrow u d s$. See their Figure 9.

[10] AABOUD 17AI searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with one or more isolated lepton, at least eight jets, either zero or many b-jets, for evidence of R-parity violating decays of the gluino. No significant excess above the Standard Model expectations is observed. Limits up to 1.65 TeV are set on the gluino mass in R-parity-violating supersymmetry models with $\widetilde{g} \rightarrow t \widetilde{t}$, $\widetilde{t} \rightarrow b s$ through the non-zero λ''_{323} coupling. See their Figure 9.

[11] AABOUD 17AI searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with one or more isolated lepton, at least eight jets, either zero or many b-jets, for evidence of R-parity violating decays of the gluino. No significant excess above the Standard Model expectations is observed. Limits up to 1.8 TeV are set on the gluino mass in R-parity-violating supersymmetry models as Tglu1A with the LSP decay through the non-zero λ' coupling as $\widetilde{\chi}^0_1 \rightarrow q q \ell$. See their Figure 9.

[12] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.8 TeV are set on the gluino mass in R-parity-violating supersymmetry models as Tglu3A with LSP decaying through the non-zero λ''_{112} coupling as $\widetilde{\chi}^0_1 \rightarrow u d s$. See their Figure 5(d).

[13] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.75 TeV are set on the gluino mass in R-parity-violating supersymmetry models as Tglu1A with LSP decaying through the non-zero λ' coupling as $\widetilde{\chi}^0_1 \rightarrow q q \ell$. See their Figure 5(c).

[14] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.45 TeV are set on the gluino mass in R-parity-violating supersymmetry models where $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow s d$ through the non-zero λ''_{321} coupling. See their Figure 5(b).

[15] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 1.45 TeV are set on the gluino mass in R-parity-violating supersymmetry models where $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow b d$ through the non-zero λ''_{313} coupling. See their Figure 5(a).

[16] AABOUD 17AJ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two same-sign or three leptons, jets and large missing transverse momentum. No significant excess above the Standard Model expectations is observed. Limits up to 400 GeV are set on the down type squark ($\widetilde{d}_R$ mass in R-parity-violating supersymmetry models where $\widetilde{d}_R \rightarrow t b$ through the non-zero λ''_{313} coupling or $\widetilde{d}_R \rightarrow t s$ through the non-zero λ''_{321}. See their Figure 5(e) and 5(f).

[17] AABOUD 17AZ searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with at least seven jets and large missing transverse momentum. Selected events are further classified based on the presence of large R-jets or b-jets and no leptons. No significant excess above the Standard Model expectations is observed. Limits are set for R-parity violating decays of the gluino assuming $\widetilde{g} \rightarrow t \widetilde{t}_1$ and $\widetilde{t}_1 \rightarrow b s$ through the non-zero λ''_{323} couplings. The range 625–1375 GeV is excluded for $m_{\widetilde{t}_1} = 400$ GeV. See their Figure 7b.

[18] KHACHATRYAN 17Y searched in 19.7 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing at least 8 or 10 jets, possibly b-tagged, coming from R-parity-violating decays of supersymmetric particles. No excess over the expected background is observed. Limits are derived on the gluino mass, assuming various RPV decay modes, see Fig. 7.

[19] KHACHATRYAN 16BJ searched in 2.3 fb^{-1} of pp collisions at $\sqrt{s}=13$ TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the following simplified models: Tglu3A and Tglu3D, see Fig. 4, Tglu3B and Tglu3C, see Fig. 5, and Tglu1B, see Fig. 7.

[20] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events containing 0 or 1 leptons and b-tagged jets, coming from R-parity-violating decays of supersymmetric particles. No excess over the expected background is observed. Limits are derived on the gluino mass, assuming the RPV $\widetilde{g} \rightarrow t b s$ decay, see Fig. 7 and 10.

[21] AAD 15BV summarized and extended ATLAS searches for gluinos and first- and second-generation squarks in final states containing jets and missing transverse momentum, with or without leptons or b-jets in the $\sqrt{s}$ =8 TeV data set collected in 2012. The paper reports the results of new interpretations and statistical combinations of previously published analyses, as well as new analyses. Exclusion limits at 95% C.L. are set on the gluino mass in several R-parity conserving models, leading to a generalized constraint on gluino masses exceeding 1150 GeV for lightest supersymmetric particle masses below 100 GeV. See their Figs. 10, 19, 20, 21, 23, 25, 26, 29-37.

[22] AAD 14X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events with at least four leptons (electrons, muons, taus) in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in an R-parity violating simplified model where the decay $\widetilde{g} \to q\overline{q}\widetilde{\chi}^0_1$, with $\widetilde{\chi}^0_1 \to \ell^\pm \ell^\mp \nu$, takes place with a branching ratio of 100%, see Fig. 8.

[23] CHATRCHYAN 14P searched in 19.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for three-jet resonances produced in the decay of a gluino in R-parity violating supersymmetric models. No excess over the expected SM background is observed. Assuming a 100% branching ratio for the gluino decay into three light-flavour jets, limits are set on the cross section of gluino pair production, see Fig. 7, and gluino masses below 650 GeV are excluded at 95% C.L. Assuming a 100% branching ratio for the gluino decaying to one b-quark jet and two light-flavour jets, gluino masses between 200 GeV and 835 GeV are excluded at 95% C L.

[24] AABOUD 18CF searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with several jets, possibly b-jets, and large-radius jets for evidence of R-parity violating decays of the gluino. No significant excess above the Standard Model expectations is observed. Limits between 1000 and 1875 GeV are set on the gluino mass in R-parity-violating supersymmetry models as Tglu2RPV with the LSP decay through the non-zero λ'' coupling as $\widetilde{\chi}^0_1 \to qqq$. The most stringent limit is obtained for $m_{\widetilde{\chi}^0_1}$ = 1000 GeV, the weakest for $m_{\widetilde{\chi}^0_1}$ = 50 GeV. See their Figure 7(b). Figure 7(a) presents results for gluinos directly decaying into 3 quarks, Tglu1RPV.

[25] KHACHATRYAN 16BX searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing 4 leptons coming from R-parity-violating decays of $\widetilde{\chi}^0_1 \to \ell\ell\nu$ with $\lambda_{121} \neq 0$ or $\lambda_{122} \neq 0$. No excess over the expected background is observed. Limits are derived on the gluino, squark and stop masses, see Fig. 23.

[26] AAD 15CB searched for events containing at least one long-lived particle that decays at a significant distance from its production point (displaced vertex, DV) into two leptons or into five or more charged particles in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV. The dilepton signature is characterised by DV formed from at least two lepton candidates. Four different final states were considered for the multitrak signature, in which the DV must be accompanied by a high-transverse momentum muon or electron candidate that originates from the DV, jets or missing transverse momentum. No events were observed in any of the signal regions. Results were interpreted in SUSY scenarios involving R-parity violation, split supersymmetry, and gauge mediation. See their Fig. 12–20.

[27] AAD 15X searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for events containing large number of jets, no requirements on missing transverse momentum and no isolated electrons or muons. The sensitivity of the search is enhanced by considering the number of b-tagged jets and the scalar sum of masses of large-radius jets in an event. No evidence was found for excesses above the expected level of Standard Model background. Exclusion limits at 95% C.L. are set on the gluino mass assuming the gluino decays to various quark flavors, and for various neutralino masses. See their Fig. 11–16.

[28] AAD 14AX searched in 20.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for the strong production of supersymmetric particles in events containing either zero or at last one high high-p_T lepton, large missing transverse momentum, high jet multiplicity and at least three jets identified as originating from b-quarks. No excess over the expected SM background is observed. Limits are derived in mSUGRA/CMSSM models with tanβ = 30, $A_0 = -2m_0$ and $\mu > 0$, see their Fig. 14. Also, exclusion limits in simplified models containing gluinos and scalar top and bottom quarks are set, see their Figures 12, 13.

[29] AAD 14E searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for strongly produced supersymmetric particles in events containing jets and two same-sign leptons or three leptons. The search also utilises jets originating from b-quarks, missing transverse momentum and other variables. No excess over the expected SM background is observed. Exclusion limits are derived in simplified models containing gluinos and squarks, see Figures 5 and 6. In the $\widetilde{g} \rightarrow q q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \rightarrow W^{(*)\pm} \widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \rightarrow Z^{(*)} \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^{\pm}} = 0.5\ m_{\widetilde{\chi}_1^0} + m_{\widetilde{g}}$, $m_{\widetilde{\chi}_2^0} = 0.5\ (m_{\widetilde{\chi}_1^0} + m_{\widetilde{\chi}_1^{\pm}})$, $m_{\widetilde{\chi}_1^0} < 520$ GeV. In the $\widetilde{g} \rightarrow q q' \widetilde{\chi}_1^{\pm}$, $\widetilde{\chi}_1^{\pm} \rightarrow \ell^{\pm} \nu \widetilde{\chi}_1^0$ or $\widetilde{g} \rightarrow q q' \widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \rightarrow \ell^{\pm} \ell^{\mp} (\nu \nu) \widetilde{\chi}_1^0$ simplified model, the following assumptions have been made: $m_{\widetilde{\chi}_1^{\pm}} = m_{\widetilde{\chi}_2^0} = 0.5\ (m_{\widetilde{\chi}_1^0} + m_{\widetilde{g}})$, $m_{\widetilde{\chi}_1^0} < 660$ GeV. Limits are also derived in the mSUGRA/CMSSM, bRPV and GMSB models, see their Fig. 8.

[30] CHATRCHYAN 14H searched in 19.5 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for events with two isolated same-sign dileptons and jets in the final state. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in simplified models where the R-parity violating decay $\widetilde{g} \rightarrow t b s$ takes place with a branching ratio of 100%, see Fig. 8.

Long-lived $\widetilde{g}$ (Gluino) mass limit

Limits on light gluinos ($m_{\widetilde{g}} < 5$ GeV) were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>1980	95	[1] AABOUD	19AT	ATLS	R-hadrons, Tglu1A, metastable
>2060	95	[2] AABOUD	19C	ATLS	R-hadrons, Tglu1A, $\tau \geq 10$ ns, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1890	95	[2] AABOUD	19C	ATLS	R-hadrons, Tglu1A, stable
>2400	95	[3] SIRUNYAN	19BH	CMS	long-lived $\widetilde{g}$, RPV, $\widetilde{g} \rightarrow \overline{t}\overline{b}\overline{s}$, 10 mm $< c\tau <$ 250 mm
>2300	95	[3] SIRUNYAN	19BH	CMS	long-lived $\widetilde{g}$, GMSB, $\widetilde{g} \rightarrow g \widetilde{G}$, 20 mm $< c\tau <$ 110 mm
>2100	95	[4] SIRUNYAN	19BT	CMS	long-lived $\widetilde{g}$, GMSB, $\widetilde{g} \rightarrow g \widetilde{G}$, 0.3 m $< c\tau <$ 30 m
>2500	95	[4] SIRUNYAN	19BT	CMS	long-lived $\widetilde{g}$, GMSB, $\widetilde{g} \rightarrow g \widetilde{G}$, $c\tau = 1$ m
>1900	95	[4] SIRUNYAN	19BT	CMS	long-lived $\widetilde{g}$, GMSB, $\widetilde{g} \rightarrow g \widetilde{G}$, $c\tau = 100$ m
>2370	95	[5] AABOUD	18S	ATLS	displaced vertex + $\not{E}_T$, long-lived Tglu1A, $m_{\widetilde{\chi}_1^0} = 100$ GeV, and τ=0.17 ns
>1600	95	[6] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$, Tglu1A, $c\tau < 0.1$ mm, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1750	95	[6] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$, Tglu1A, $c\tau = 1$ mm, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1640	95	[6] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$, Tglu1A, $c\tau = 10$ mm, $m_{\widetilde{\chi}_1^0} = 100$ GeV
>1490	95	[6] SIRUNYAN	18AY	CMS	jets+$\not{E}_T$, Tglu1A, $c\tau = 100$ mm, $m_{\widetilde{\chi}_1^0} = 100$ GeV

>1300	95	[6] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu1A, cτ = 1 m, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 960	95	[6] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu1A, cτ = 10 m, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 900	95	[6] SIRUNYAN	18AY	CMS	jets+$\not\!\!E_T$, Tglu1A, cτ = 100 m, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>2200	95	[7] SIRUNYAN	18DV	CMS	long-lived $\widetilde{g}$, RPV, $\widetilde{g} \rightarrow \overline{t}\overline{b}\overline{s}$, 0.6 mm < c$\tau$ < 80 mm
>1000	95	[8] KHACHATRY...	17AR	CMS	long-lived $\widetilde{g}$, RPV, $\widetilde{g} \rightarrow t\overline{b}\overline{s}$, c$\tau$ = 0.3 mm
>1300	95	[8] KHACHATRY...	17AR	CMS	long-lived $\widetilde{g}$, RPV, $\widetilde{g} \rightarrow t\overline{b}\overline{s}$, c$\tau$ = 1.0 mm
>1400	95	[8] KHACHATRY...	17AR	CMS	long-lived $\widetilde{g}$, RPV, $\widetilde{g} \rightarrow t\overline{b}\overline{s}$, 2 mm < c$\tau$ < 30 mm
>1580	95	[9] AABOUD	16B	ATLS	long-lived R-hadrons
> 740–1590	95	[10] AABOUD	16C	ATLS	R-hadrons, Tglu1A, $\tau \geq$ 0.4 ns, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1570	95	[10] AABOUD	16C	ATLS	R-hadrons, Tglu1A, stable
>1610	95	[11] KHACHATRY...	16BW	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.1, cloud interaction model
>1580	95	[11] KHACHATRY...	16BW	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.1, charge-suppressed interaction model
>1520	95	[11] KHACHATRY...	16BW	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.5, cloud interaction model
>1540	95	[11] KHACHATRY...	16BW	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.5, charge-suppressed interaction model
>1270	95	[12] AAD	15AE	ATLS	$\widetilde{g}$ R-hadron, generic R-hadron model
>1360	95	[12] AAD	15AE	ATLS	$\widetilde{g}$ decaying to 300 GeV stable sleptons, LeptoSUSY model
>1115	95	[13] AAD	15BM	ATLS	$\widetilde{g}$ R-hadron, stable
>1185	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow (g/q\overline{q})\widetilde{\chi}_1^0$, lifetime 10 ns, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1099	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow (g/q\overline{q})\widetilde{\chi}_1^0$, lifetime 10 ns, $m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1182	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}_1^0$, lifetime 10 ns, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1157	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow t\overline{t}\widetilde{\chi}_1^0$, lifetime 10 ns, $m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0}$ = 480 GeV
> 869	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow (g/q\overline{q})\widetilde{\chi}_1^0$, lifetime 1 ns, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 821	95	[13] AAD	15BM	ATLS	$\widetilde{g} \rightarrow (g/q\overline{q})\widetilde{\chi}_1^0$, lifetime 1 ns, $m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0}$ = 100 GeV

> 836	95	[13] AAD	15BM	ATLS	$\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$, lifetime 1 ns, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 836	95	[13] AAD	15BM	ATLS	$\widetilde{g} \to t\overline{t}\widetilde{\chi}_1^0$, lifetime 10 ns, $m_{\widetilde{g}} - m_{\widetilde{\chi}_1^0}$ = 480 GeV
>1000	95	[14] KHACHATRY...	15AK	CMS	$\widetilde{g}$ R-hadrons, 10 μs< τ <1000 s
> 880	95	[14] KHACHATRY...	15AK	CMS	$\widetilde{g}$ R-hadrons, 1 μs< τ <1000 s
• • • We do not use the following data for averages, fits, limits, etc. • • •					
> 985	95	[15] AAD	13AA	ATLS	$\widetilde{g}$, R-hadrons, generic interaction model
> 832	95	[16] AAD	13BC	ATLS	R-hadrons, $\widetilde{g} \to g/q\overline{q}\widetilde{\chi}_1^0$, generic R-hadron model, lifetime between 10^{-5} and 10^3 s, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
>1322	95	[17] CHATRCHYAN	13AB	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.1, cloud interaction model
none 200–341	95	[18] AAD	12P	ATLS	long-lived $\widetilde{g} \to g\widetilde{\chi}_1^0$, $m_{\widetilde{\chi}_1^0}$ = 100 GeV
> 640	95	[19] CHATRCHYAN	12AN	CMS	long-lived $\widetilde{g} \to g\widetilde{\chi}_1^0$
>1098	95	[20] CHATRCHYAN	12L	CMS	long-lived $\widetilde{g}$ forming R-hadrons, f = 0.1
> 586	95	[21] AAD	11K	ATLS	stable $\widetilde{g}$
> 544	95	[22] AAD	11P	ATLS	stable $\widetilde{g}$, GMSB scenario, tanβ=5
> 370	95	[23] KHACHATRY...	11	CMS	long lived $\widetilde{g}$
> 398	95	[24] KHACHATRY...	11C	CMS	stable $\widetilde{g}$

[1] AABOUD 19AT searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for metastable and stable R-hadrons. Multiple search strategies for a wide range of lifetimes, corresponding to path lengths of a few meters, are defined. No significant deviations from the expected Standard Model background are observed. Gluino R-hadrons with lifetimes of the order of 50 ns are excluded at 95% C.L. for masses below 1980 GeV using the muon-spectrometer agnostic analysis. Using the full-detector search, the observed lower limits on the mass are 2000 GeV. See their Figure 9 (top).

[2] AABOUD 19C searched in 36.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for metastable and stable R-hadrons arising as excesses in the mass distribution of reconstructed tracks with high transverse momentum and large dE/dx. Gluino R-hadrons with lifetimes above 10 ns are excluded at 95% C.L. with lower mass limit range between 1000 GeV and 2060 GeV, see their Figure 5(a). Masses smaller than 1290 GeV are excluded for a lifetime of 1 ns, see their Figure 6. In the case of stable R-hadrons, the lower mass limit is 1890 GeV, see their Figure 5(b).

[3] SIRUNYAN 19BH searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived particles decaying into jets, with each long-lived particle having a decay vertex well displaced from the production vertex. The selected events are found to be consistent with standard model predictions. Limits are set on the gluino mass in a GMSB model where the gluino is decaying via $\widetilde{g} \to g\widetilde{G}$, see their Figure 4 and in an RPV model of supersymmetry where the gluino is decaying via $\widetilde{g} \to \overline{t}\overline{b}\overline{s}$, see their Figures 5. Limits are also set on the stop mass in two RPV models, see their Figure 6 (for $\widetilde{t} \to b\ell$ decays) and Figure 7 (for $\widetilde{t} \to \overline{d}\overline{d}$ decays).

[4] SIRUNYAN 19BT searched in 137 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived particles decaying to displaced, nonprompt jets and missing transverse momentum. Candidate signal events are identified using the timing capabilities of the CMS electromagnetic calorimeter. The results of the search are found to be consistent with the

background predictions. Limits are set on the gluino mass in a GMSB model where long-lived gluinos are pair produced and decaying via $\widetilde{g} \rightarrow g\widetilde{G}$, see their Figures 4 and 5.

[5] AABOUD 18S searched in 32.8 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived gluinos in final states with large missing transverse momentum and at least one high-mass displaced vertex with five or more tracks. The observed yield is consistent with the expected background. Exclusion limits are derived for Tglu1A models predicting the existence of long-lived gluinos reaching roughly m($\widetilde{g}$) = 2000 GeV to 2370 GeV for m($\widetilde{\chi}^0_1$) = 100 GeV and gluino lifetimes between 0.02 and 10 ns, see their Fig. 8. Limits are presented also as a function of the lifetime (for a fixed gluino-neutralino mass difference of 100 GeV) and of the gluino and neutralino masses (for a fixed lifetime of 1 ns). See their Fig. 9 and 10 respectively.

[6] SIRUNYAN 18AY searched in 35.9 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events containing one or more jets and significant $\not\!\!E_T$. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass in the Tglu1A, Tglu2A and Tglu3A simplified models, see their Figure 3. Limits are also set on squark, sbottom and stop masses in the Tsqk1, Tsbot1, Tstop1 and Tstop4 simplified models, see their Figure 3. Finally, limits are set on long-lived gluino masses in a Tglu1A simplified model where the gluino is metastable or long-lived with proper decay lengths in the range 10^{-3} mm $< c\tau < 10^5$ mm, see their Figure 4.

[7] SIRUNYAN 18DV searched in 38.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived particles in events with multiple jets and two displaced vertices composed of many tracks. No events with two well-separated high-track-multiplicity vertices were observed. Limits are set on the stop and the gluino mass in RPV models of supersymmetry where the stop (gluino) is decaying solely into dijet (multijet) final states, see their Figures 6 and 7.

[8] KHACHATRYAN 17AR searched in 17.6 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for R-parity-violating SUSY in which long-lived neutralinos or gluinos decay into multijet final states. No significant excess above the Standard Model expectations is observed. Limits are set on the gluino mass for a range of mean proper decay lengths ($c\tau$), see their Fig. 7. The upper limits on the production cross section times branching ratio squared (Fig. 7) are also applicable to long-lived neutralinos.

[9] AABOUD 16B searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived R-hadrons using observables related to large ionization losses and slow propagation velocities, which are signatures of heavy charged particles traveling significantly slower than the speed of light. Exclusion limits at 95% C.L. are set on the long-lived gluino masses exceeding 1580 GeV. See their Fig. 5.

[10] AABOUD 16C searched in 3.2 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for long-lived and stable R-hadrons identified by anomalous specific ionization energy loss in the ATLAS Pixel detector. Gluino R-hadrons with lifetimes above 0.4 ns are excluded at 95% C.L. with lower mass limit range between 740 GeV and 1590 GeV. In the case of stable R-hadrons, the lower mass limit is 1570 GeV. See their Figs. 5 and 6.

[11] KHACHATRYAN 16BW searched in 2.5 fb^{-1} of pp collisions at $\sqrt{s}$ = 13 TeV for events with heavy stable charged particles, identified by their anomalously high energy deposits in the silicon tracker and/or long time-of-flight measurements by the muon system. No evidence for an excess over the expected background is observed. Limits are derived for pair production of gluinos as a function of mass, depending on the interaction model and on the fraction f, of produced gluinos hadronizing into a $\widetilde{g}$ - gluon state, see Fig. 4 and Table 7.

[12] AAD 15AE searched in 19.1 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for heavy long-lived charged particles, measured through their specific ionization energy loss in the ATLAS pixel detector or their time-of-flight in the ALTAS muon system. In the absence of an excess of events above the expected backgrounds, limits are set R-hadrons in various scenarios, see Fig. 11. Limits are also set in LeptoSUSY models where the gluino decays to stable 300 GeV leptons, see Fig. 9.

[13] AAD 15BM searched in 18.4 fb^{-1} of pp collisions at $\sqrt{s}$ = 8 TeV for stable and metastable non-relativistic charged particles through their anomalous specific ionization energy loss in the ATLAS pixel detector. In absence of an excess of events above the

expected backgrounds, limits are set within a generic R-hadron model, on stable gluino R-hadrons (see Table 5) and on metastable gluino R-hadrons decaying to ($g/q\overline{q}$) plus a light $\widetilde{\chi}_1^0$ (see Fig. 7) and decaying to $t\overline{t}$ plus a light $\widetilde{\chi}_1^0$ (see Fig. 9).

[14] KHACHATRYAN 15AK looked in a data set corresponding to 18.6 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV, and a search interval corresponding to 281 h of trigger lifetime, for long-lived particles that have stopped in the CMS detector. No evidence for an excess over the expected background in a cloud interaction model is observed. Assuming the decay $\widetilde{g} \to g\widetilde{\chi}_1^0$ and lifetimes between 1 μs and 1000 s, limits are derived on $\widetilde{g}$ production as a function of $m_{\widetilde{\chi}_1^0}$, see Figs. 4 and 6. The exclusions require that $m_{\widetilde{\chi}_1^0}$ is kinematically consistent with the minimum values of the jet energy thresholds used.

[15] AAD 13AA searched in 4.7 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events containing colored long-lived particles that hadronize forming R-hadrons. No significant excess above the expected background was found. Long-lived R-hadrons containing a $\widetilde{g}$ are excluded for masses up to 985 GeV at 95% C.L in a general interaction model. Also, limits independent of the fraction of R-hadrons that arrive charged in the muon system were derived, see Fig. 6.

[16] AAD 13BC searched in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV and in 22.9 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for bottom squark R-hadrons that have come to rest within the ATLAS calorimeter and decay at some later time to hadronic jets and a neutralino. In absence of an excess of events above the expected backgrounds, limits are set on gluino masses for different decays, lifetimes, and neutralino masses, see their Table 6 and Fig. 10.

[17] CHATRCHYAN 13AB looked in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV and in 18.8 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{g}$'s. No evidence for an excess over the expected background is observed. Limits are derived for pair production of gluinos as a function of mass (see Fig. 8 and Table 5), depending on the fraction, f, of formation of $\widetilde{g}-$g (R-gluonball) states. The quoted limit is for f = 0.1, while for f = 0.5 it degrades to 1276 GeV. In the conservative scenario where every hadronic interaction causes it to become neutral, the limit decreases to 928 GeV for f = 0.1.

[18] AAD 12P looked in 31 pb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events with pair production of long-lived gluinos. The hadronization of the gluinos leads to R-hadrons which may stop inside the detector and later decay via $\widetilde{g} \to g\widetilde{\chi}_1^0$ during gaps between the proton bunches. No significant excess over the expected background is observed. From a counting experiment, a limit at 95% C.L. on the cross section as a function of $m_{\widetilde{g}}$ is derived for $m_{\widetilde{\chi}_1^0} = 100$ GeV, see Fig. 4. The limit is valid for lifetimes between 10^{-5} and 10^3 seconds and assumes the *Generic* matter interaction model for the production cross section.

[19] CHATRCHYAN 12AN looked in 4.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events with pair production of long-lived gluinos. The hadronization of the gluinos leads to R-hadrons which may stop inside the detector and later decay via $\widetilde{g} \to g\widetilde{\chi}_1^0$ during gaps between the proton bunches. No significant excess over the expected background is observed. From a counting experiment, a limit at 95% C.L. on the cross section as a function of $m_{\widetilde{g}}$ is derived, see Fig. 3. The mass limit is valid for lifetimes between 10^{-5} and 10^3 seconds, for what they call "the daughter gluon energy $E_g >$" 100 GeV and assuming the *cloud* interaction model for R-hadrons. Supersedes KHACHATRYAN 11.

[20] CHATRCHYAN 12L looked in 5.0 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{g}$'s. No evidence for an excess over the expected background is observed. Limits are derived for pair production of gluinos as a function of mass (see Fig. 3), depending on the fraction, f, of formation of $\widetilde{g}-$g (R-glueball) states. The quoted limit is for f = 0.1, while for f = 0.5 it degrades to 1046 GeV. In the conservative scenario where

every hadronic interaction causes it to become neutral, the limit decreases to 928 GeV for f=0.1. Supersedes KHACHATRYAN 11C.

[21] AAD 11K looked in 34 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or time of flight in the tile calorimeter, from pair production of $\widetilde{g}$. No evidence for an excess over the SM expectation is observed. Limits are derived for pair production of gluinos as a function of mass (see Fig. 4), for a fraction, f = 10%, of formation of $\widetilde{g}-g$ (R-gluonball). If instead of a phase space driven approach for the hadronic scattering of the R-hadrons, a triple-Regge model or a bag-model is used, the limit degrades to 566 and 562 GeV, respectively.

[22] AAD 11P looked in 37 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with heavy stable particles, reconstructed and identified by their time of flight in the Muon System. There is no requirement on their observation in the tracker to increase the sensitivity to cases where gluinos have a large fraction, f, of formation of neutral $\widetilde{g}-g$ (R-gluonball). No evidence for an excess over the SM expectation is observed. Limits are derived as a function of mass (see Fig. 4), for f=0.1. For fractions f = 0.5 and 1.0 the limit degrades to 537 and 530 GeV, respectively.

[23] KHACHATRYAN 11 looked in 10 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with pair production of long-lived gluinos. The hadronization of the gluinos leads to R-hadrons which may stop inside the detector and later decay via $\widetilde{g} \rightarrow g\widetilde{\chi}_1^0$ during gaps between the proton bunches. No significant excess over the expected background is observed. From a counting experiment, a limit at 95% C.L. on the cross section times branching ratio is derived for $m_{\widetilde{g}}-m_{\widetilde{\chi}_1^0}$ > 100 GeV, see their Fig. 2. Assuming 100% branching ratio, lifetimes between 75 ns and 3×10^5 s are excluded for $m_{\widetilde{g}}$ = 300 GeV. The $\widetilde{g}$ mass exclusion is obtained with the same assumptions for lifetimes between 10 μs and 1000 s, but shows some dependence on the model for R-hadron interactions with matter, illustrated in Fig. 3. From a time-profile analysis, the mass exclusion is 382 GeV for a lifetime of 10 μs under the same assumptions as above.

[24] KHACHATRYAN 11C looked in 3.1 pb^{-1} of pp collisions at $\sqrt{s}$ = 7 TeV for events with heavy stable particles, identified by their anomalous dE/dx in the tracker or additionally requiring that it be identified as muon in the muon chambers, from pair production of $\widetilde{g}$. No evidence for an excess over the expected background is observed. Limits are derived for pair production of gluinos as a function of mass (see Fig. 3), depending on the fraction, f, of formation of $\widetilde{g}-g$ (R-gluonball). The quoted limit is for f=0.1, while for f=0.5 it degrades to 357 GeV. In the conservative scenario where every hadronic interaction causes it to become neutral, the limit decreases to 311 GeV for f=0.1.

Light $\widetilde{G}$ (Gravitino) mass limits from collider experiments

The following are bounds on light ($\ll$ 1 eV) gravitino indirectly inferred from its coupling to matter suppressed by the gravitino decay constant.

Unless otherwise stated, all limits assume that other supersymmetric particles besides the gravitino are too heavy to be produced. The gravitino is assumed to be undetected and to give rise to a missing energy ($\not{E}$) signature.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$> 3.5 \times 10^{-4}$	95	[1] AAD	15BH	ATLS	jet + $\not{E}_T$, $pp \rightarrow (\widetilde{q}/\widetilde{g})\widetilde{G}$, $m_{\widetilde{q}} = m_{\widetilde{g}}$ = 500 GeV

$>3\ \times 10^{-4}$	95	[1] AAD	15BH	ATLS	jet + $\not\!\!E_T$, $pp \to (\widetilde{q}/\widetilde{g})\widetilde{G}$, $m_{\widetilde{q}} = m_{\widetilde{g}} = 1000$ GeV
$>2\ \times 10^{-4}$	95	[1] AAD	15BH	ATLS	jet + $\not\!\!E_T$, $pp \to (\widetilde{q}/\widetilde{g})\widetilde{G}$, $m_{\widetilde{q}} = m_{\widetilde{g}} = 1500$ GeV
$>1.09 \times 10^{-5}$	95	[2] ABDALLAH	05B	DLPH	$e^+e^- \to \widetilde{G}\widetilde{G}\gamma$
$>1.35 \times 10^{-5}$	95	[3] ACHARD	04E	L3	$e^+e^- \to \widetilde{G}\widetilde{G}\gamma$
$>1.3\ \times 10^{-5}$		[4] HEISTER	03C	ALEP	$e^+e^- \to \widetilde{G}\widetilde{G}\gamma$
$>11.7\ \times 10^{-6}$	95	[5] ACOSTA	02H	CDF	$p\overline{p} \to \widetilde{G}\widetilde{G}\gamma$
$>8.7\ \times 10^{-6}$	95	[6] ABBIENDI,G	00D	OPAL	$e^+e^- \to \widetilde{G}\widetilde{G}\gamma$

[1] AAD 15BH searched in 20.3 fb^{-1} of pp collisions at $\sqrt{s} = 8$ TeV for associated production of a light gravitino and a squark or gluino. The squark (gluino) is assumed to decay exclusively to a quark (gluon) and a gravitino. No evidence was found for an excess above the expected level of Standard Model background and 95% C.L. lower limits were set on the gravitino mass as a function of the squark/gluino mass, both in the case of degenerate and non-degenerate squark/gluino masses, see Figs. 14 and 15.

[2] ABDALLAH 05B use data from $\sqrt{s} = 180$–208 GeV. They look for events with a single photon + $\not\!\!E$ final states from which a cross section limit of $\sigma < 0.18$ *pb* at 208 GeV is obtained, allowing a limit on the mass to be set. Supersedes the results of ABREU 00Z.

[3] ACHARD 04E use data from $\sqrt{s} = 189$–209 GeV. They look for events with a single photon + $\not\!\!E$ final states from which a limit on the Gravitino mass is set corresponding to $\sqrt{F} > 238$ GeV. Supersedes the results of ACCIARRI 99R.

[4] HEISTER 03C use the data from $\sqrt{s} = 189$–209 GeV to search for $\gamma\not\!\!E_T$ final states.

[5] ACOSTA 02H looked in 87 pb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}$=1.8 TeV for events with a high-E_T photon and $\not\!\!E_T$. They compared the data with a GMSB model where the final state could arise from $q\overline{q} \to \widetilde{G}\widetilde{G}\gamma$. Since the cross section for this process scales as $1/|F|^4$, a limit at 95% CL is derived on $|F|^{1/2} > 221$ GeV. A model independent limit for the above topology is also given in the paper.

[6] ABBIENDI,G 00D searches for $\gamma\not\!\!E$ final states from $\sqrt{s}$=189 GeV.

Supersymmetry miscellaneous results

Results that do not appear under other headings or that make nonminimal assumptions.

Some earlier papers are now obsolete and have been omitted. They were last listed in our PDG 14 edition: K. Olive, *et al.* (Particle Data Group), Chinese Physics **C38** 070001 (2014) (http://pdg.lbl.gov).

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AAD	20C	ATLS	habemus MSSM, m_A–tanβ plane
none 450–1400	95	[2] AAD	20L	ATLS	heavy neutral Higgs bosons, hMSSM, m_A–tanβ plane
>65	95	[3] AABOUD	16AF	ATLS	selected ATLAS searches on EWK sector
none 0–2	95	[4] AAD	16AG	ATLS	dark photon, γ_d, in SUSY- and Higgs-portal models
		[5] AAD	13P	ATLS	dark γ, hidden valley
		[6] AALTONEN	12AB	CDF	hidden-valley Higgs
none 100–185	95	[7] AAD	11AA	ATLS	scalar gluons
		[8] CHATRCHYAN	11E	CMS	$\mu\mu$ resonances
		[9] ABAZOV	10N	D0	γ_D, hidden valley

[1] AAD 20C uses a statistical combination of six final states $b\overline{b}b\overline{b}$, $b\overline{b}WW$, $b\overline{b}\tau\tau$, $WWWW$, $b\overline{b}\gamma\gamma$, and $WW\gamma\gamma$ to search for non-resonant and resonant production of

Higgs boson pairs. The search uses 36.1 fb^{-1} of pp collisions data at $\sqrt{s}=13$ TeV. Constraints in the habemus Minimal Supersymmetric Standard Model in the (m_A, tanβ) parameter space are placed, see their Figure 7(b).

[2] AAD 20L used 27.8 fb^{-1} of pp collision data at $\sqrt{s}=13$ TeV to search for heavy neutral Higgs bosons produced in association with at least one b-quark and decaying into a pair of b-quarks. The data are compatible with SM expectations, yielding no significant excess of events in the mass range 450–1400 GeV, see their Fig. 11. Exclusion limits at 95% C.L. were derived in hMSSM scenarios as a function of m_A and tanβ, see their Fig. 9 and 10.

[3] AABOUD 16AF uses a selection of searches by ATLAS for the electroweak production of SUSY particles studying resulting constraints on dark matter candidates. They use 20 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV. A likelihood-driven scan of an effective model focusing on the gaugino-higgsino and Higgs sector of the pMSSM is performed. The ATLAS searches impact models where $m_{\chi_1^0} < 65$ GeV, excluding 86% of them. See their Figs. 2, 4, and 6.

[4] AAD 16AG searches for prompt lepton-jets using 20 fb^{-1} of pp collisions at $\sqrt{s}=8$ TeV collected with the ATLAS detector. Lepton-jets are expected from decays of low-mass dark photons in SUSY-portal and Higgs-portal models. No significant excess of events is observed and 95% CL upper limits are computed on the production cross section times branching ratio for two prompt lepton-jets in models predicting 2 or 4 γ_d via SUSY-portal topologies, for γ_d mass values between 0 and 2 GeV. See their Figs 9 and 10. The results are also interpreted in terms of a 90% CL exclusion region in kinetic mixing and dark-photon mass parameter space. See their Fig. 13.

[5] AAD 13P searched in 5 fb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for single lepton-jets with at least four muons; pairs of lepton-jets, each with two or more muons; and pairs of lepton-jets with two or more electrons. All of these could be signatures of Hidden Valley supersymmetric models. No statistically significant deviations from the Standard Model expectations are found. 95% C.L. limits are placed on the production cross section times branching ratio of dark photons for several parameter sets of a Hidden Valley model.

[6] AALTONEN 12AB looked in 5.1 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}=1.96$ TeV for anomalous production of multiple low-energy leptons in association with a W or Z boson. Such events may occur in hidden valley models in which a supersymmetric Higgs boson is produced in association with a W or Z boson, with $H \rightarrow \widetilde{\chi}_1^0 \widetilde{\chi}_1^0$ pair and with the $\widetilde{\chi}_1^0$ further decaying into a dark photon (γ_D) and the unobservable lightest SUSY particle of the hidden sector. As the γ_D is expected to be light, it may decay into a lepton pair. No significant excess over the SM expectation is observed and a limit at 95% C.L. is set on the cross section for a benchmark model of supersymmetric hidden-valley Higgs production.

[7] AAD 11AA looked in 34 pb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events with ≥ 4 jets originating from pair production of scalar gluons, each decaying to two gluons. No two-jet resonances are observed over the SM background. Limits are derived on the cross section times branching ratio (see Fig. 3). Assuming 100% branching ratio for the decay to two gluons, the quoted exclusion range is obtained, except for a 5 GeV mass window around 140 GeV.

[8] CHATRCHYAN 11E looked in 35 pb^{-1} of pp collisions at $\sqrt{s}=7$ TeV for events with collimated μ pairs (leptonic jets) from the decay of hidden sector states. No evidence for new resonance production is found. Limits are derived and compared to various SUSY models (see Fig. 4) where the LSP, either the $\widetilde{\chi}_1^0$ or a $\widetilde{q}$, decays to dark sector particles.

[9] ABAZOV 10N looked in 5.8 fb^{-1} of $p\overline{p}$ collisions at $\sqrt{s}=1.96$ TeV for events from hidden valley models in which a $\widetilde{\chi}_1^0$ decays into a dark photon, γ_D, and the unobservable lightest SUSY particle of the hidden sector. As the γ_D is expected to be light, it may decay into a tightly collimated lepton pair, called lepton jet. They searched for events with $\not\!\!E_T$ and two isolated lepton jets observable by an opposite charged lepton pair ee, $e\mu$ or $\mu\mu$. No significant excess over the SM expectation is observed, and a limit at 95% C.L. on the cross section times branching ratio is derived, see their Table I. They also

examined the invariant mass of the lepton jets for a narrow resonance, see their Fig. 4, but found no evidence for a signal.

REFERENCES FOR Supersymmetric Particle Searches

AAD	21B	EPJ C81 11	G. Aad *et al.*	(ATLAS Collab.)
SIRUNYAN	21B	EPJ C81 3	A.M. Sirunyan *et al.*	(CMS Collab.)
AABOUD	20	EPJ C80 754	M. Aaboud *et al.*	(ATLAS Collab.)
AAD	20AL	JHEP 2010 062	G. Aad *et al.*	(ATLAS Collab.)
AAD	20AN	JHEP 2010 005	G. Aad *et al.*	(ATLAS Collab.)
AAD	20AS	EPJ C80 1080	G. Aad *et al.*	(ATLAS Collab.)
AAD	20C	PL B800 135103	G. Aad *et al.*	(ATLAS Collab.)
AAD	20D	PL B801 135114	G. Aad *et al.*	(ATLAS Collab.)
AAD	20H	PR D101 032009	G. Aad *et al.*	(ATLAS Collab.)
AAD	20I	PR D101 052005	G. Aad *et al.*	(ATLAS Collab.)
AAD	20K	PR D101 072001	G. Aad *et al.*	(ATLAS Collab.)
AAD	20L	PR D102 032004	G. Aad *et al.*	(ATLAS Collab.)
AAD	20M	PR D102 032006	G. Aad *et al.*	(ATLAS Collab.)
AAD	20O	EPJ C80 123	G. Aad *et al.*	(ATLAS Collab.)
AAD	20R	EPJ C80 691	G. Aad *et al.*	(ATLAS Collab.)
AAD	20S	EPJ C80 737	G. Aad *et al.*	(ATLAS Collab.)
AAD	20V	JHEP 2006 046	G. Aad *et al.*	(ATLAS Collab.)
ABAZAJIAN	20	PR D102 043012	K.N. Abazajian *et al.*	(UCI, VPI, TOKY+)
ABDALLAH	20	PR D102 062001	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ABE	20G	PR D102 072002	K. Abe *et al.*	(Super-Kamiokande Collab.)
ALBERT	20	PR D101 103001	A. Albert *et al.*	(HAWC Collab.)
ALBERT	20A	PL B805 135439	A. Albert *et al.*	(ANTARES Collab.)
ALBERT	20C	PR D102 082002	A. Albert *et al.*	(ANTARES and IceCube Collab.)
ALVAREZ	20	JCAP 2009 004	A. Alvarez *et al.*	
HOOF	20	JCAP 2002 012	S. Hoof, A. Geringer-Sameth, R. Trotta	(GOET+)
SIRUNYAN	20AH	JHEP 2005 032	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20AU	PRL 124 041803	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20B	PL B801 135183	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20BJ	JHEP 2009 149	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20E	PR D101 052010	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20N	PL B806 135502	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20P	EPJ C80 189	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20T	EPJ C80 752	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	20U	JHEP 2002 015	A.M. Sirunyan *et al.*	(CMS Collab.)
AABOUD	19AT	PR D99 092007	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	19AU	PR D100 012006	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	19C	PL B788 96	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	19G	PR D99 012001	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	19I	PR D99 012009	M. Aaboud *et al.*	(ATLAS Collab.)
AAD	19H	JHEP 1912 060	G. Aad *et al.*	(ATLAS Collab.)
ABE	19	PL B789 45	K. Abe *et al.*	(XMASS Collab.)
AJAJ	19	PR D100 022004	R. Ajaj *et al.*	(DEAP-3600 Collab.)
AMOLE	19	PR D100 022001	C. Amole *et al.*	(PICO Collab.)
APRILE	19A	PRL 122 141301	E. Aprile *et al.*	(XENON1T Collab.)
DI-MAURO	19	PR D99 123027	M. Di Mauro *et al.*	
JOHNSON	19	PR D99 103007	C. Johnson *et al.*	
LI	19D	PR D99 123519	S. Li *et al.*	
SIRUNYAN	19AG	JHEP 1906 143	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19AO	EPJ C79 305	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19AU	EPJ C79 444	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19AW	PL B790 140	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BH	PR D99 032011	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BI	PR D99 032014	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BJ	PR D99 052002	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BT	PL B797 134876	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19BU	JHEP 1908 150	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19CA	PR D100 112003	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19CE	PRL 123 241801	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19CH	JHEP 1910 244	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19CI	JHEP 1911 109	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19F	PR D99 012010	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19K	JHEP 1901 154	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19S	JHEP 1903 031	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	19U	JHEP 1903 101	A.M. Sirunyan *et al.*	(CMS Collab.)

XIA	19A	PL B792 193	J. Xia *et al.*	(PandaX-II Collab.)
AABOUD	18AQ	JHEP 1806 108	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18AR	JHEP 1806 107	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18AS	JHEP 1806 022	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18AY	EPJ C78 154	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18BB	EPJ C78 250	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18BJ	EPJ C78 625	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18BT	EPJ C78 995	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18BV	JHEP 1809 050	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18CF	PL B785 136	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18CO	PR D98 092012	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18I	JHEP 1801 126	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18P	PR D97 032003	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18R	PR D97 052010	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18S	PR D97 052012	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18U	PR D97 092006	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18V	PR D97 112001	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18Y	PR D98 032008	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	18Z	PR D98 032009	M. Aaboud *et al.*	(ATLAS Collab.)
ABDALLAH	18	PRL 120 201101	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ADHIKARI	18	NAT 564 83	G. Adhikari *et al.*	(COSINE-100 Collab.)
AGNES	18A	PR D98 102006	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNESE	18A	PRL 120 061802	R. Agnese *et al.*	(SuperCDMS Collab.)
AHNEN	18	JCAP 1803 009	M.L. Ahnen *et al.*	(MAGIC Collab.)
ALBERT	18B	JCAP 1806 043	A. Albert *et al.*	(HAWC Collab.)
ALBERT	18C	PR D98 123012	A. Albert *et al.*	(HAWC Collab.)
AMAUDRUZ	18	PRL 121 071801	P.A. Amaudruz *et al.*	(DEAP-3600 Collab.)
APRILE	18	PRL 121 111302	E. Aprile *et al.*	(XENON1T Collab.)
SIRUNYAN	18AA	PL B780 118	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AC	PL B780 384	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AD	PL B780 432	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AJ	PL B782 440	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AK	PL B783 114	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AL	JHEP 1802 067	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AN	JHEP 1803 167	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AO	JHEP 1803 166	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AP	JHEP 1803 160	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AR	JHEP 1803 076	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AT	JHEP 1804 073	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18AY	JHEP 1805 025	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18B	PL B778 263	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18BR	JHEP 1808 016	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18C	PR D97 032009	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18D	PR D97 012007	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DI	JHEP 1809 065	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DN	JHEP 1811 079	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DP	JHEP 1811 151	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DV	PR D98 092011	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18EA	PRL 121 141802	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18M	PRL 120 241801	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18O	PR D97 032007	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	18X	PL B779 166	A.M. Sirunyan *et al.*	(CMS Collab.)
AABOUD	17AF	JHEP 1708 006	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AI	JHEP 1709 088	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AJ	JHEP 1709 084	M. Aaboud *et al.*	(ATLAS Collab.)
Also		JHEP 1908 121 (errat.)	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AR	PR D96 112010	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AX	JHEP 1711 195	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AY	JHEP 1712 085	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17AZ	JHEP 1712 034	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17BE	EPJ C77 898	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	17N	EPJ C77 144	M. Aaboud *et al.*	(ATLAS Collab.)
AAIJ	17Z	EPJ C77 224	R. Aaij *et al.*	(LHCb Collab.)
AARTSEN	17	EPJ C77 82	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	17A	EPJ C77 146	M.G. Aartsen *et al.*	(IceCube Collab.)
Also		EPJ C79 214 (errat.)	M.G. Aartsen *et al.*	(IceCube Collab.)
AARTSEN	17C	EPJ C77 627	M.G. Aartsen *et al.*	(IceCube Collab.)
AKERIB	17	PRL 118 021303	D.S. Akerib *et al.*	(LUX Collab.)

AKERIB	17A	PRL 118 251302	D.S. Akerib *et al.*	(LUX Collab.)
AMOLE	17	PRL 118 251301	C. Amole *et al.*	(PICO Collab.)
APRILE	17G	PRL 119 181301	E. Aprile *et al.*	(XENON Collab.)
ARCHAMBAU...	17	PR D95 082001	S. Archambault *et al.*	(VERITAS Collab.)
ATHRON	17B	EPJ C77 824	P. Athron *et al.*	(GAMBIT Collab.)
BATTAT	17	ASP 91 65	J.B.R. Battat *et al.*	(DRIFT-IId Collab.)
BEHNKE	17	ASP 90 85	E. Behnke *et al.*	(PICASSO Collab.)
CUI	17A	PRL 119 181302	X. Cui *et al.*	(PandaX-II Collab.)
FU	17	PRL 118 071301	C. Fu *et al.*	(PandaX-II Collab.)
Also		PRL 120 049902 (errat.)	C. Fu *et al.*	(PandaX-II Collab.)
KHACHATRY...	17	PR D95 012003	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17A	PRL 118 021802	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17AD	PR D96 012004	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17AR	PR D95 012009	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17AS	PR D95 012011	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17AW	EPJ C77 635	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17L	JHEP 1704 018	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17P	EPJ C77 294	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17S	PL B767 403	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17V	PL B769 391	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)
SIRUNYAN	17AF	PRL 119 151802	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AS	JHEP 1710 019	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AT	JHEP 1710 005	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AW	JHEP 1711 029	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AY	JHEP 1712 142	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17AZ	EPJ C77 710	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17K	EPJ C77 327	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17P	PR D96 032003	A.M. Sirunyan *et al.*	(CMS Collab.)
SIRUNYAN	17S	EPJ C77 578	A.M. Sirunyan *et al.*	(CMS Collab.)
AABOUD	16AC	EPJ C76 683	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16AF	JHEP 1609 175	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16B	PL B760 647	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16C	PR D93 112015	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16D	PR D94 032005	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16J	PR D94 052009	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16M	EPJ C76 517	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16N	EPJ C76 392	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16P	EPJ C76 541	M. Aaboud *et al.*	(ATLAS Collab.)
AABOUD	16Q	EPJ C76 547	M. Aaboud *et al.*	(ATLAS Collab.)
AAD	16AA	PR D93 052002	G. Aad *et al.*	(ATLAS Collab.)
AAD	16AD	PR D94 032003	G. Aad *et al.*	(ATLAS Collab.)
AAD	16AG	JHEP 1602 062	G. Aad *et al.*	(ATLAS Collab.)
AAD	16AM	JHEP 1606 067	G. Aad *et al.*	(ATLAS Collab.)
AAD	16AY	EPJ C76 81	G. Aad *et al.*	(ATLAS Collab.)
AAD	16BB	EPJ C76 259	G. Aad *et al.*	(ATLAS Collab.)
AAD	16BG	EPJ C76 565	G. Aad *et al.*	(ATLAS Collab.)
AAD	16V	PL B757 334	G. Aad *et al.*	(ATLAS Collab.)
AARTSEN	16C	JCAP 1604 022	M.G. Aartsen *et al.*	(IceCube Collab.)
ABDALLAH	16	PRL 117 111301	H. Abdallah *et al.*	(H.E.S.S. Collab.)
ADRIAN-MAR...	16	PL B759 69	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
AHNEN	16	JCAP 1602 039	M.L. Ahnen *et al.*	(MAGIC and Fermi-LAT Collab.)
AKERIB	16	PRL 116 161301	D.S. Akerib *et al.*	(LUX Collab.)
AKERIB	16A	PRL 116 161302	D.S. Akerib *et al.*	(LUX Collab.)
AMOLE	16	PR D93 052014	C. Amole *et al.*	(PICO Collab.)
APRILE	16B	PR D94 122001	E. Aprile *et al.*	(XENON100 Collab.)
AVRORIN	16	ASP 81 12	A.D. Avrorin *et al.*	(BAIKAL Collab.)
BECHTLE	16	EPJ C76 96	P. Bechtle *et al.*	
CIRELLI	16	JCAP 1607 041	M. Cirelli, M. Taoso	(LPNHE, MADE)
KHACHATRY...	16AA	PL B759 479	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16AC	PL B760 178	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16AM	PR D93 092009	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16AV	JHEP 1607 027	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16AY	JHEP 1608 122	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BE	EPJ C76 317	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BJ	EPJ C76 439	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BK	EPJ C76 460	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BS	JHEP 1610 006	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BT	JHEP 1610 129	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BW	PR D94 112004	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16BX	PR D94 112009	V. Khachatryan *et al.*	(CMS Collab.)

KHACHATRY...	16BY	JHEP 1612 013	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16R	PL B757 6	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16V	PL B758 152	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	16Y	PL B759 9	V. Khachatryan *et al.*	(CMS Collab.)
LEITE	16	JCAP 1611 021	N. Leite *et al.*	
TAN	16B	PRL 117 121303	A. Tan *et al.*	(PandaX Collab.)
AAD	15AB	PR D92 012010	G. Aad *et al.*	(ATLAS Collab.)
AAD	15AE	JHEP 1501 068	G. Aad *et al.*	(ATLAS Collab.)
AAD	15AI	JHEP 1504 116	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BA	EPJ C75 208	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BG	EPJ C75 318	G. Aad *et al.*	(ATLAS Collab.)
Also		EPJ C75 463	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BH	EPJ C75 299	G. Aad *et al.*	(ATLAS Collab.)
Also		EPJ C75 408 (errat.)	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BM	EPJ C75 407	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BV	JHEP 1510 054	G. Aad *et al.*	(ATLAS Collab.)
AAD	15BX	JHEP 1510 134	G. Aad *et al.*	(ATLAS Collab.)
AAD	15CA	PR D92 072001	G. Aad *et al.*	(ATLAS Collab.)
AAD	15CB	PR D92 072004	G. Aad *et al.*	(ATLAS Collab.)
AAD	15CJ	EPJ C75 510	G. Aad	(ATLAS Collab.)
AAD	15CS	PR D91 012008	G. Aad *et al.*	(ATLAS Collab.)
Also		PR D92 059903 (errat.)	G. Aad *et al.*	(ATLAS Collab.)
AAD	15J	PRL 114 142001	G. Aad *et al.*	(ATLAS Collab.)
AAD	15K	PRL 114 161801	G. Aad *et al.*	(ATLAS Collab.)
AAD	15O	PRL 115 031801	G. Aad *et al.*	(ATLAS Collab.)
AAD	15X	PR D91 112016	G. Aad *et al.*	(ATLAS Collab.)
AAIJ	15BD	EPJ C75 595	R. Aaij *et al.*	(LHCb Collab.)
AARTSEN	15E	EPJ C75 492	M.G. Aartsen *et al.*	(IceCube Collab.)
ACKERMANN	15	PR D91 122002	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ACKERMANN	15A	JCAP 1509 008	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ACKERMANN	15B	PRL 115 231301	M. Ackermann *et al.*	(Fermi-LAT Collab.)
AGNES	15	PL B743 456	P. Agnes *et al.*	(DarkSide-50 Collab.)
AGNESE	15B	PR D92 072003	R. Agnese *et al.*	(SuperCDMS Collab.)
BAGNASCHI	15	EPJ C75 500	E.A. Bagnaschi *et al.*	
BUCKLEY	15	PR D91 102001	M.R. Buckley *et al.*	
CHOI	15	PRL 114 141301	K. Choi *et al.*	(Super-Kamiokande Collab.)
KHACHATRY...	15AB	JHEP 1501 096	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AD	JHEP 1504 124	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AF	JHEP 1505 078	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AH	JHEP 1506 116	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AK	EPJ C75 151	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AO	EPJ C75 325	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AR	PL B743 503	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15AZ	PR D92 072006	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15E	PRL 114 061801	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15I	PL B745 5	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15L	PL B747 98	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15O	PL B748 255	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15W	PR D91 052012	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	15X	PR D91 052018	V. Khachatryan *et al.*	(CMS Collab.)
ROLBIECKI	15	PL B750 247	K. Rolbiecki, J. Tattersall	(MADE, HEID)
AAD	14AE	JHEP 1409 176	G. Aad *et al.*	(ATLAS Collab.)
AAD	14AG	JHEP 1409 103	G. Aad *et al.*	(ATLAS Collab.)
AAD	14AJ	JHEP 1409 015	G. Aad *et al.*	(ATLAS Collab.)
AAD	14AV	JHEP 1410 096	G. Aad *et al.*	(ATLAS Collab.)
AAD	14AX	JHEP 1410 024	G. Aad *et al.*	(ATLAS Collab.)
AAD	14B	EPJ C74 2883	G. Aad *et al.*	(ATLAS Collab.)
AAD	14BD	JHEP 1411 118	G. Aad *et al.*	(ATLAS Collab.)
AAD	14BH	PR D90 112005	G. Aad *et al.*	(ATLAS Collab.)
AAD	14E	JHEP 1406 035	G. Aad *et al.*	(ATLAS Collab.)
AAD	14F	JHEP 1406 124	G. Aad *et al.*	(ATLAS Collab.)
AAD	14G	JHEP 1405 071	G. Aad *et al.*	(ATLAS Collab.)
AAD	14H	JHEP 1404 169	G. Aad *et al.*	(ATLAS Collab.)
AAD	14K	PR D90 012004	G. Aad *et al.*	(ATLAS Collab.)
AAD	14T	PR D90 052008	G. Aad *et al.*	(ATLAS Collab.)
AAD	14X	PR D90 052001	G. Aad *et al.*	(ATLAS Collab.)
AALTONEN	14	PR D90 012011	T. Aaltonen *et al.*	(CDF Collab.)
ACKERMANN	14	PR D89 042001	M. Ackermann *et al.*	(Fermi-LAT Collab.)
AKERIB	14	PRL 112 091303	D.S. Akerib *et al.*	(LUX Collab.)
ALEKSIC	14	JCAP 1402 008	J. Aleksic *et al.*	(MAGIC Collab.)
AVRORIN	14	ASP 62 12	A.D. Avrorin *et al.*	(BAIKAL Collab.)

BUCHMUEL...	14	EPJ C74 2809	O. Buchmueller *et al.*	
BUCHMUEL...	14A	EPJ C74 2922	O. Buchmueller *et al.*	
CHATRCHYAN	14AH	PR D90 112001	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14H	JHEP 1401 163	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14I	JHEP 1406 055	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14N	PL B733 328	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14P	PL B730 193	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14R	PR D90 032006	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	14U	PRL 112 161802	S. Chatrchyan *et al.*	(CMS Collab.)
CZAKON	14	PRL 113 201803	M. Czakon *et al.*	(AACH, CAMB, UCB, LBL+)
FELIZARDO	14	PR D89 072013	M. Felizardo *et al.*	(SIMPLE Collab.)
KHACHATRY...	14C	PL B736 371	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	14I	EPJ C74 3036	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	14L	PR D90 092007	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	14T	PL B739 229	V. Khachatryan *et al.*	(CMS Collab.)
PDG	14	CP C38 070001	K. Olive *et al.*	(PDG Collab.)
ROSZKOWSKI	14	JHEP 1408 067	L. Roszkowski, E.M. Sessolo, A.J. Williams	(WINR)
AAD	13	PL B718 841	G. Aad *et al.*	(ATLAS Collab.)
AAD	13AA	PL B720 277	G. Aad *et al.*	(ATLAS Collab.)
AAD	13AI	PL B723 15	G. Aad *et al.*	(ATLAS Collab.)
AAD	13AP	PR D88 012001	G. Aad *et al.*	(ATLAS Collab.)
AAD	13AU	JHEP 1310 189	G. Aad *et al.*	(ATLAS Collab.)
AAD	13B	PL B718 879	G. Aad *et al.*	(ATLAS Collab.)
AAD	13BC	PR D88 112003	G. Aad *et al.*	(ATLAS Collab.)
AAD	13BD	PR D88 112006	G. Aad *et al.*	(ATLAS Collab.)
AAD	13H	JHEP 1301 131	G. Aad *et al.*	(ATLAS Collab.)
AAD	13L	PR D87 012008	G. Aad *et al.*	(ATLAS Collab.)
AAD	13P	PL B719 299	G. Aad *et al.*	(ATLAS Collab.)
AAD	13Q	PL B719 261	G. Aad *et al.*	(ATLAS Collab.)
AAD	13R	PL B719 280	G. Aad *et al.*	(ATLAS Collab.)
AALTONEN	13I	PR D88 031103	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	13Q	PRL 110 201802	T. Aaltonen *et al.*	(CDF Collab.)
AARTSEN	13C	PR D88 122001	M.G. Aartsen *et al.*	(IceCube Collab.)
ABAZOV	13B	PR D87 052011	V.M. Abazov *et al.*	(D0 Collab.)
ACKERMANN	13A	PR D88 082002	M. Ackermann *et al.*	(Fermi-LAT Collab.)
ADRIAN-MAR...	13	JCAP 1311 032	S. Adrian-Martinez *et al.*	(ANTARES Collab.)
AGNESE	13	PR D88 031104	R. Agnese *et al.*	(CDMS Collab.)
AGNESE	13A	PRL 111 251301	R. Agnese *et al.*	(CDMS Collab.)
APRILE	13	PRL 111 021301	E. Aprile *et al.*	(XENON100 Collab.)
BERGSTROM	13	PRL 111 171101	L. Bergstrom *et al.*	
BOLIEV	13	JCAP 1309 019	M. Boliev *et al.*	
CABRERA	13	JHEP 1307 182	M. Cabrera, J. Casas, R. de Austri	
CALIBBI	13	JHEP 1310 132	L. Calibbi *et al.*	
CHATRCHYAN	13	PL B718 815	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13AB	JHEP 1307 122	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13AH	PL B722 273	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13AO	PR D87 072001	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13AT	PR D88 052017	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13AV	PRL 111 081802	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13G	JHEP 1301 077	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13H	PL B719 42	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13T	EPJ C73 2568	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13V	JHEP 1303 037	S. Chatrchyan *et al.*	(CMS Collab.)
Also		JHEP 1307 041 (errat.)	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	13W	JHEP 1303 111	S. Chatrchyan *et al.*	(CMS Collab.)
ELLIS	13B	EPJ C73 2403	J. Ellis *et al.*	
JIN	13	JCAP 1311 026	H.-B. Jin, Y.-L. Wu, Y.-F. Zhou	
KOPP	13	PR D88 076013	J. Kopp	
STREGE	13	JCAP 1304 013	C. Strege *et al.*	
AAD	12AF	PL B714 180	G. Aad *et al.*	(ATLAS Collab.)
AAD	12AG	PL B714 197	G. Aad *et al.*	(ATLAS Collab.)
AAD	12AN	PRL 108 181802	G. Aad *et al.*	(ATLAS Collab.)
AAD	12AS	PRL 108 261804	G. Aad *et al.*	(ATLAS Collab.)
AAD	12AX	PR D85 012006	G. Aad *et al.*	(ATLAS Collab.)
Also		PR D87 099903 (errat.)	G. Aad *et al.*	(ATLAS Collab.)
AAD	12BJ	EPJ C72 1993	G. Aad *et al.*	(ATLAS Collab.)
AAD	12CJ	PR D86 092002	G. Aad *et al.*	(ATLAS Collab.)
AAD	12CM	EPJ C72 2215	G. Aad *et al.*	(ATLAS Collab.)
AAD	12CP	PL B718 411	G. Aad *et al.*	(ATLAS Collab.)
AAD	12CT	JHEP 1212 124	G. Aad *et al.*	(ATLAS Collab.)
AAD	12P	EPJ C72 1965	G. Aad *et al.*	(ATLAS Collab.)

AAD	12R	PL B707 478	G. Aad *et al.*	(ATLAS Collab.)
AAD	12T	PL B709 137	G. Aad *et al.*	(ATLAS Collab.)
AAD	12W	PL B710 67	G. Aad *et al.*	(ATLAS Collab.)
AALTONEN	12AB	PR D85 092001	T. Aaltonen *et al.*	(CDF Collab.)
ABAZOV	12AD	PR D86 071701	V.M. Abazov *et al.*	(D0 Collab.)
AKIMOV	12	PL B709 14	D.Yu. Akimov *et al.*	(ZEPLIN-III Collab.)
AKULA	12	PR D85 075001	S. Akula *et al.*	(NEAS, MICH)
ANGLOHER	12	EPJ C72 1971	G. Angloher *et al.*	(CRESST-II Collab.)
APRILE	12	PRL 109 181301	E. Aprile *et al.*	(XENON100 Collab.)
ARBEY	12A	PL B708 162	A. Arbey *et al.*	
ARCHAMBAU...	12	PL B711 153	S. Archambault *et al.*	(PICASSO Collab.)
BAER	12	JHEP 1205 091	H. Baer, V. Barger, A. Mustafayev	(OKLA, WISC+)
BALAZS	12	EPJ C73 2563	C. Balazs *et al.*	
BECHTLE	12	JHEP 1206 098	P. Bechtle *et al.*	
BEHNKE	12	PR D86 052001	E. Behnke *et al.*	(COUPP Collab.)
Also		PR D90 079902 (errat.)	E. Behnke *et al.*	(COUPP Collab.)
BESKIDT	12	EPJ C72 2166	C. Beskidt *et al.*	(KARLE, JINR, ITEP)
BOTTINO	12	PR D85 095013	A. Bottino, N. Fornengo, S. Scopel	(TORI, S0GA)
BUCHMUEL...	12	EPJ C72 2020	O. Buchmueller *et al.*	
CAO	12A	PL B710 665	J. Cao *et al.*	
CHATRCHYAN	12	PR D85 012004	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12AE	PRL 109 171803	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12AI	JHEP 1208 110	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12AL	JHEP 1206 169	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12AN	JHEP 1208 026	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12AT	JHEP 1210 018	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12BJ	JHEP 1211 147	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12BK	JHEP 1211 172	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12BO	JHEP 1212 055	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	12L	PL B713 408	S. Chatrchyan *et al.*	(CMS Collab.)
DAW	12	ASP 35 397	E. Daw *et al.*	(DRIFT-IId Collab.)
DREINER	12A	EPL 99 61001	H.K. Dreiner, M. Kramer, J. Tattersall	(BONN+)
ELLIS	12B	EPJ C72 2005	J. Ellis, K. Olive	
FELIZARDO	12	PRL 108 201302	M. Felizardo *et al.*	(SIMPLE Collab.)
FENG	12B	PR D85 075007	J. Feng, K. Matchev, D. Sanford	
KADASTIK	12	JHEP 1205 061	M. Kadastik *et al.*	
KIM	12	PRL 108 181301	S.C. Kim *et al.*	(KIMS Collab.)
STREGE	12	JCAP 1203 030	C. Strege *et al.*	(LOIC, AMST, MADU, GRAN+)
AAD	11AA	EPJ C71 1828	G. Aad *et al.*	(ATLAS Collab.)
AAD	11G	PRL 106 131802	G. Aad *et al.*	(ATLAS Collab.)
AAD	11H	PRL 106 251801	G. Aad *et al.*	(ATLAS Collab.)
AAD	11K	PL B701 1	G. Aad *et al.*	(ATLAS Collab.)
AAD	11O	PL B701 398	G. Aad *et al.*	(ATLAS Collab.)
AAD	11P	PL B703 428	G. Aad *et al.*	(ATLAS Collab.)
AAD	11Z	EPJ C71 1809	G. Aad *et al.*	(ATLAS Collab.)
AHMED	11A	PR D84 011102	Z. Ahmed *et al.*	(CDMS and EDELWEISS Collabs.)
ARMENGAUD	11	PL B702 329	E. Armengaud *et al.*	(EDELWEISS-II Collab.)
BUCHMUEL...	11	EPJ C71 1583	O. Buchmueller *et al.*	
BUCHMUEL...	11B	EPJ C71 1722	O. Buchmueller *et al.*	
CHATRCHYAN	11B	JHEP 1106 093	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	11D	JHEP 1107 113	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	11E	JHEP 1107 098	S. Chatrchyan *et al.*	(CMS Collab.)
CHATRCHYAN	11V	PL B704 411	S. Chatrchyan *et al.*	(CMS Collab.)
KHACHATRY...	11	PRL 106 011801	V. Khachatryan *et al.*	(CMS Collab.)
KHACHATRY...	11C	JHEP 1103 024	V. Khachatryan *et al.*	(CMS Collab.)
ROSZKOWSKI	11	PR D83 015014	L. Roszkowski *et al.*	
AALTONEN	10	PRL 104 011801	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	10R	PRL 105 081802	T. Aaltonen *et al.*	(CDF Collab.)
AALTONEN	10Z	PRL 105 191801	T. Aaltonen *et al.*	(CDF Collab.)
ABAZOV	10L	PL B693 95	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	10M	PRL 105 191802	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	10N	PRL 105 211802	V.M. Abazov *et al.*	(D0 Collab.)
ABAZOV	10P	PRL 105 221802	V.M. Abazov *et al.*	(D0 Collab.)
ACKERMANN	10	JCAP 1005 025	M. Ackermann	(Fermi-LAT Collab.)
ARMENGAUD	10	PL B687 294	E. Armengaud *et al.*	(EDELWEISS-II Collab.)
ELLIS	10	EPJ C69 201	J. Ellis, A. Mustafayev, K. Olive	
ABAZOV	09M	PRL 102 161802	V.M. Abazov *et al.*	(D0 Collab.)
AHMED	09	PRL 102 011301	Z. Ahmed *et al.*	(CDMS Collab.)
ANGLOHER	09	ASP 31 270	G. Angloher *et al.*	(CRESST Collab.)
BUCHMUEL...	09	EPJ C64 391	O. Buchmueller *et al.*	(LOIC, FNAL, CERN+)
DREINER	09	EPJ C62 547	H. Dreiner *et al.*	

LEBEDENKO	09	PR D80 052010	V.N. Lebedenko *et al.*	(ZEPLIN-III Collab.)
LEBEDENKO	09A	PRL 103 151302	V.N. Lebedenko *et al.*	(ZEPLIN-III Collab.)
SORENSEN	09	NIM A601 339	P. Sorensen *et al.*	(XENON10 Collab.)
ABAZOV	08F	PL B659 856	V.M. Abazov *et al.*	(D0 Collab.)
ANGLE	08	PRL 100 021303	J. Angle *et al.*	(XENON10 Collab.)
ANGLE	08A	PRL 101 091301	J. Angle *et al.*	(XENON10 Collab.)
BEDNYAKOV	08	PAN 71 111	V.A. Bednyakov, H.P. Klapdor-Kleingrothaus, I.V. Krivosheina	
		Translated from YAF 71 112.		
BEHNKE	08	SCI 319 933	E. Behnke	(COUPP Collab.)
BENETTI	08	ASP 28 495	P. Benetti *et al.*	(WARP Collab.)
BUCHMUEL...	08	JHEP 0809 117	O. Buchmueller *et al.*	
ELLIS	08	PR D78 075012	J. Ellis, K. Olive, P. Sandick	(CERN, MINN)
ABULENCIA	07H	PRL 98 131804	A. Abulencia *et al.*	(CDF Collab.)
ALNER	07A	ASP 28 287	G.J. Alner *et al.*	(ZEPLIN-II Collab.)
CALIBBI	07	JHEP 0709 081	L. Calibbi *et al.*	
ELLIS	07	JHEP 0706 079	J. Ellis, K. Olive, P. Sandick	(CERN, MINN)
LEE	07A	PRL 99 091301	H.S. Lee *et al.*	(KIMS Collab.)
ABBIENDI	06B	EPJ C46 307	G. Abbiendi *et al.*	(OPAL Collab.)
ACHTERBERG	06	ASP 26 129	A. Achterberg *et al.*	(AMANDA Collab.)
ACKERMANN	06	ASP 24 459	M. Ackermann *et al.*	(AMANDA Collab.)
AKERIB	06	PR D73 011102	D.S. Akerib *et al.*	(CDMS Collab.)
AKERIB	06A	PRL 96 011302	D.S. Akerib *et al.*	(CDMS Collab.)
ALLANACH	06	PR D73 015013	B.C. Allanach *et al.*	
BENOIT	06	PL B637 156	A. Benoit *et al.*	
DE-AUSTRI	06	JHEP 0605 002	R.R. de Austri, R. Trotta, L. Roszkowski	
DEBOER	06	PL B636 13	W. de Boer *et al.*	
LEP-SLC	06	PRPL 427 257	ALEPH, DELPHI, L3, OPAL, SLD and working groups	
SHIMIZU	06A	PL B633 195	Y. Shimizu *et al.*	
SMITH	06	PL B642 567	N.J.T. Smith, A.S. Murphy, T.J. Summer	
ABAZOV	05A	PRL 94 041801	V.M. Abazov *et al.*	(D0 Collab.)
ABDALLAH	05B	EPJ C38 395	J. Abdallah *et al.*	(DELPHI Collab.)
AKERIB	05	PR D72 052009	D.S. Akerib *et al.*	(CDMS Collab.)
ALNER	05	PL B616 17	G.J. Alner *et al.*	(UK Dark Matter Collab.)
ALNER	05A	ASP 23 444	G.J. Alner *et al.*	(UK Dark Matter Collab.)
BAER	05	JHEP 0507 065	H. Baer *et al.*	(FSU, MSU, HAWA)
BARNABE-HE...	05	PL B624 186	M. Barnabe-Heider *et al.*	(PICASSO Collab.)
ELLIS	05	PR D71 095007	J. Ellis *et al.*	
SANGLARD	05	PR D71 122002	V. Sanglard *et al.*	(EDELWEISS Collab.)
ABBIENDI	04	EPJ C32 453	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI	04F	EPJ C33 149	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI	04H	EPJ C35 1	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI	04N	PL B602 167	G. Abbiendi *et al.*	(OPAL Collab.)
ABDALLAH	04H	EPJ C34 145	J. Abdallah *et al.*	(DELPHI Collab.)
ABDALLAH	04M	EPJ C36 1	J. Abdallah *et al.*	(DELPHI Collab.)
Also		EPJ C37 129 (errat.)	J. Abdallah *et al.*	(DELPHI Collab.)
ACHARD	04	PL B580 37	P. Achard *et al.*	(L3 Collab.)
ACHARD	04E	PL B587 16	P. Achard *et al.*	(L3 Collab.)
AKERIB	04	PRL 93 211301	D.S. Akerib *et al.*	(CDMS II Collab.)
BALTZ	04	JHEP 0410 052	E. Baltz, P. Gondolo	
BELANGER	04	JHEP 0403 012	G. Belanger *et al.*	
BOTTINO	04	PR D69 037302	A. Bottino *et al.*	
DESAI	04	PR D70 083523	S. Desai *et al.*	(Super-Kamiokande Collab.)
ELLIS	04	PR D69 015005	J. Ellis *et al.*	
ELLIS	04B	PR D70 055005	J. Ellis *et al.*	
HEISTER	04	PL B583 247	A. Heister *et al.*	(ALEPH Collab.)
PIERCE	04A	PR D70 075006	A. Pierce	
ABBIENDI	03L	PL B572 8	G. Abbiendi *et al.*	(OPAL Collab.)
ABDALLAH	03M	EPJ C31 421	J. Abdallah *et al.*	(DELPHI Collab.)
AHMED	03	ASP 19 691	B. Ahmed *et al.*	(UK Dark Matter Collab.)
AKERIB	03	PR D68 082002	D.S. Akerib *et al.*	(CDMS Collab.)
BAER	03	JCAP 0305 006	H. Baer, C. Balazs	
BAER	03A	JCAP 0309 007	H. Baer *et al.*	
BOTTINO	03	PR D68 043506	A. Bottino *et al.*	
BOTTINO	03A	PR D67 063519	A. Bottino, N. Fornengo, S. Scopel	
CHATTOPAD...	03	PR D68 035005	U. Chattopadhyay, A. Corsetti, P. Nath	
ELLIS	03	ASP 18 395	J. Ellis, K.A. Olive, Y. Santoso	
ELLIS	03B	NP B652 259	J. Ellis *et al.*	
ELLIS	03C	PL B565 176	J. Ellis *et al.*	
ELLIS	03D	PL B573 162	J. Ellis *et al.*	
ELLIS	03E	PR D67 123502	J. Ellis *et al.*	
HEISTER	03C	EPJ C28 1	A. Heister *et al.*	(ALEPH Collab.)

HEISTER	03G	EPJ C31 1	A. Heister *et al.*	(ALEPH Collab.)
KLAPDOR-K...	03	ASP 18 525	H.V. Klapdor-Kleingrothaus *et al.*	
LAHANAS	03	PL B568 55	A. Lahanas, D. Nanopoulos	
TAKEDA	03	PL B572 145	A. Takeda *et al.*	
ABRAMS	02	PR D66 122003	D. Abrams *et al.*	(CDMS Collab.)
ACOSTA	02H	PRL 89 281801	D. Acosta *et al.*	(CDF Collab.)
ANGLOHER	02	ASP 18 43	G. Angloher *et al.*	(CRESST Collab.)
ARNOWITT	02	hep-ph/0211417	R. Arnowitt, B. Dutta	
ELLIS	02B	PL B532 318	J. Ellis, A. Ferstl, K.A. Olive	
HEISTER	02	PL B526 191	A. Heister *et al.*	(ALEPH Collab.)
HEISTER	02E	PL B526 206	A. Heister *et al.*	(ALEPH Collab.)
HEISTER	02J	PL B533 223	A. Heister *et al.*	(ALEPH Collab.)
HEISTER	02N	PL B544 73	A. Heister *et al.*	(ALEPH Collab.)
KIM	02	PL B527 18	H.B. Kim *et al.*	
KIM	02B	JHEP 0212 034	Y.G. Kim *et al.*	
LAHANAS	02	EPJ C23 185	A. Lahanas, V.C. Spanos	
MORALES	02B	ASP 16 325	A. Morales *et al.*	(COSME Collab.)
MORALES	02C	PL B532 8	A. Morales *et al.*	(IGEX Collab.)
ABREU	01	EPJ C19 29	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	01B	EPJ C19 201	P. Abreu *et al.*	(DELPHI Collab.)
BALTZ	01	PRL 86 5004	E. Baltz, P. Gondolo	
BARATE	01	PL B499 67	R. Barate *et al.*	(ALEPH Collab.)
BARATE	01B	EPJ C19 415	R. Barate *et al.*	(ALEPH Collab.)
BARGER	01C	PL B518 117	V. Barger, C. Kao	
BAUDIS	01	PR D63 022001	L. Baudis *et al.*	(Heidelberg-Moscow Collab.)
BERNABEI	01	PL B509 197	R. Bernabei *et al.*	(DAMA Collab.)
BOTTINO	01	PR D63 125003	A. Bottino *et al.*	
CORSETTI	01	PR D64 125010	A. Corsetti, P. Nath	
ELLIS	01B	PL B510 236	J. Ellis *et al.*	
ELLIS	01C	PR D63 065016	J. Ellis, A. Ferstl, K.A. Olive	
GOMEZ	01	PL B512 252	M.E. Gomez, J.D. Vergados	
LAHANAS	01	PL B518 94	A. Lahanas, D.V. Nanopoulos, V. Spanos	
ABBIENDI	00	EPJ C12 1	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI	00G	EPJ C14 51	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI	00H	EPJ C14 187	G. Abbiendi *et al.*	(OPAL Collab.)
Also		EPJ C16 707 (errat.)	G. Abbiendi *et al.*	(OPAL Collab.)
ABBIENDI,G	00D	EPJ C18 253	G. Abbiendi *et al.*	(OPAL Collab.)
ABREU	00J	PL B479 129	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00Q	PL B478 65	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00T	PL B485 95	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00U	PL B487 36	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00V	EPJ C16 211	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00W	PL B489 38	P. Abreu *et al.*	(DELPHI Collab.)
ABREU	00Z	EPJ C17 53	P. Abreu *et al.*	(DELPHI Collab.)
ABUSAIDI	00	PRL 84 5699	R. Abusaidi *et al.*	(CDMS Collab.)
ACCIARRI	00D	PL B472 420	M. Acciarri *et al.*	(L3 Collab.)
ACCOMANDO	00	NP B585 124	E. Accomando *et al.*	
BERNABEI	00	PL B480 23	R. Bernabei *et al.*	(DAMA Collab.)
BERNABEI	00C	EPJ C18 283	R. Bernabei *et al.*	(DAMA Collab.)
BERNABEI	00D	NJP 2 15	R. Bernabei *et al.*	(DAMA Collab.)
BOEHM	00B	PR D62 035012	C. Boehm, A. Djouadi, M. Drees	
ELLIS	00	PR D62 075010	J. Ellis *et al.*	
FENG	00	PL B482 388	J.L. Feng, K.T. Matchev, F. Wilczek	
LEP	00	CERN-EP-2000-016	LEP Collabs.	(ALEPH, DELPHI, L3, OPAL, SLD+)
MORALES	00	PL B489 268	A. Morales *et al.*	(IGEX Collab.)
PDG	00	EPJ C15 1	D.E. Groom *et al.*	(PDG Collab.)
SPOONER	00	PL B473 330	N.J.C. Spooner *et al.*	(UK Dark Matter Col.)
ACCIARRI	99H	PL B456 283	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	99R	PL B470 268	M. Acciarri *et al.*	(L3 Collab.)
ACCIARRI	99W	PL B471 280	M. Acciarri *et al.*	(L3 Collab.)
AMBROSIO	99	PR D60 082002	M. Ambrosio *et al.*	(Macro Collab.)
BAUDIS	99	PR D59 022001	L. Baudis *et al.*	(Heidelberg-Moscow Collab.)
BELLI	99C	NP B563 97	P. Belli *et al.*	(DAMA Collab.)
OOTANI	99	PL B461 371	W. Ootani *et al.*	
ABREU	98P	PL B444 491	P. Abreu *et al.*	(DELPHI Collab.)
ACCIARRI	98F	EPJ C4 207	M. Acciarri *et al.*	(L3 Collab.)
ACKERSTAFF	98P	PL B433 195	K. Ackerstaff *et al.*	(OPAL Collab.)
BARATE	98K	PL B433 176	R. Barate *et al.*	(ALEPH Collab.)
BARATE	98S	EPJ C4 433	R. Barate *et al.*	(ALEPH Collab.)
BERNABEI	98C	PL B436 379	R. Bernabei *et al.*	(DAMA Collab.)
ELLIS	98	PR D58 095002	J. Ellis *et al.*	

ELLIS	98B	PL B444 367	J. Ellis, T. Falk, K. Olive	
PDG	98	EPJ C3 1	C. Caso *et al.*	(PDG Collab.)
BAER	97	PR D57 567	H. Baer, M. Brhlik	
BERNABEI	97	ASP 7 73	R. Bernabei *et al.*	(DAMA Collab.)
EDSJO	97	PR D56 1879	J. Edsjo, P. Gondolo	
ARNOWITT	96	PR D54 2374	R. Arnowitt, P. Nath	
BAER	96	PR D53 597	H. Baer, M. Brhlik	
BERGSTROM	96	ASP 5 263	L. Bergstrom, P. Gondolo	
LEWIN	96	ASP 6 87	J.D. Lewin, P.F. Smith	
BEREZINSKY	95	ASP 5 1	V. Berezinsky *et al.*	
FALK	95	PL B354 99	T. Falk, K.A. Olive, M. Srednicki	(MINN, UCSB)
LOSECCO	95	PL B342 392	J.M. LoSecco	(NDAM)
ADRIANI	93M	PRPL 236 1	O. Adriani *et al.*	(L3 Collab.)
DREES	93	PR D47 376	M. Drees, M.M. Nojiri	(DESY, SLAC)
DREES	93B	PR D48 3483	M. Drees, M.M. Nojiri	
FALK	93	PL B318 354	T. Falk *et al.*	(UCB, UCSB, MINN)
KELLEY	93	PR D47 2461	S. Kelley *et al.*	(TAMU, ALAH)
MIZUTA	93	PL B298 120	S. Mizuta, M. Yamaguchi	(TOHO)
MORI	93	PR D48 5505	M. Mori *et al.*	(KEK, NIIG, TOKY, TOKA+)
BOTTINO	92	MPL A7 733	A. Bottino *et al.*	(TORI, ZARA)
Also		PL B265 57	A. Bottino *et al.*	(TORI, INFN)
DECAMP	92	PRPL 216 253	D. Decamp *et al.*	(ALEPH Collab.)
LOPEZ	92	NP B370 445	J.L. Lopez, D.V. Nanopoulos, K.J. Yuan	(TAMU)
MCDONALD	92	PL B283 80	J. McDonald, K.A. Olive, M. Srednicki	(LISB+)
ABREU	91F	NP B367 511	P. Abreu *et al.*	(DELPHI Collab.)
ALEXANDER	91F	ZPHY C52 175	G. Alexander *et al.*	(OPAL Collab.)
BOTTINO	91	PL B265 57	A. Bottino *et al.*	(TORI, INFN)
GELMINI	91	NP B351 623	G.B. Gelmini, P. Gondolo, E. Roulet	(UCLA, TRST)
GRIEST	91	PR D43 3191	K. Griest, D. Seckel	
KAMIONKOW...	91	PR D44 3021	M. Kamionkowski	(CHIC, FNAL)
MORI	91B	PL B270 89	M. Mori *et al.*	(Kamiokande Collab.)
NOJIRI	91	PL B261 76	M.M. Nojiri	(KEK)
OLIVE	91	NP B355 208	K.A. Olive, M. Srednicki	(MINN, UCSB)
ROSZKOWSKI	91	PL B262 59	L. Roszkowski	(CERN)
GRIEST	90	PR D41 3565	K. Griest, M. Kamionkowski, M.S. Turner	(UCB+)
BARBIERI	89C	NP B313 725	R. Barbieri, M. Frigeni, G. Giudice	
OLIVE	89	PL B230 78	K.A. Olive, M. Srednicki	(MINN, UCSB)
ELLIS	88D	NP B307 883	J. Ellis, R. Flores	
GRIEST	88B	PR D38 2357	K. Griest	
OLIVE	88	PL B205 553	K.A. Olive, M. Srednicki	(MINN, UCSB)
SREDNICKI	88	NP B310 693	M. Srednicki, R. Watkins, K.A. Olive	(MINN, UCSB)
ELLIS	84	NP B238 453	J. Ellis *et al.*	(CERN)
GOLDBERG	83	PRL 50 1419	H. Goldberg	(NEAS)
KRAUSS	83	NP B227 556	L.M. Krauss	(HARV)
VYSOTSKII	83	SJNP 37 948	M.I. Vysotsky	(ITEP)
		Translated from YAF 37 1597.		