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Search for pair production of top squarks at the LHC Run 2 with the ATLAS detector

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Minimal Supersymmetric Standard Model (MSSM)



Fermions-Bosons Symmetry [1]:

ATLAS (A Toroidal LHC ApparatuS)

Arranged with cylindrical symmetry and hermetic coverage.





☑ R-parity conservation is assumed ☑ The lightest supersymmetric particle (LSP) is stable \square The lightest neutralino is the LSP

✓ Signal models: \star $\tilde{t}_1 \to t \tilde{\chi}_2^0$ $\hookrightarrow Z \tilde{\chi}_1^0 \text{ (BR=0.5)}$ $\hookrightarrow h \tilde{\chi}_1^0$ (BR=0.5) \star $\tilde{t}_2 \to Z \tilde{t}_1$ $\hookrightarrow t \tilde{\chi}_1^0$ \star $\tilde{t}_2 \rightarrow h \tilde{t}_1$ $\hookrightarrow t \tilde{\chi}_1^0$ ✓ Final state characterized by:

* large missing transverse energy * b-jets

Processes: $\tilde{t}_1 \rightarrow t \tilde{\chi}_2^0 / \tilde{t}_2 \rightarrow h / Z \tilde{t}_1$ [3]

Two different analysis strategies targeting the scenarios where:

* Z boson is produced:

- \checkmark at least three leptons (electrons or muons);
- ✓ at least one same-flavour opposite-sign lepton pair
- whose invariant mass is compatible with the Z boson
- $|m_{ll} m_Z| < 15 \text{ GeV});$
- ✓ at least one b-tagged jet.

* Higgs boson is produced:

- \checkmark one or two leptons (electrons or muons);
- ✓ at least 4 b-tagged jets;
- ✓ the pair of b-tagged jets with the smallest angular distance is required to have an invariant mass consistent with the Higgs boson mass
 - $|m_{bb} m_h| < 15 \text{ GeV}$).

No significant excess has been observed.





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* cosine of the angle formed by the two resonances and the beamline in their centre of mass frame

No significant excess has been observed.

