Abstract

Searches for electroweak production of charginos, neutralinos and sleptons in final states with two (three) leptons and missing transverse momentum are presented. The analyses are based on 8 TeV data collected with the ATLAS experiment at the Large Hadron Collider. The observations are consistent with the Standard Model predictions. The limits are set on the masses of relevant SUSY particles in simplified SUSY models and phenomenological models.

Signal Selection

- Exactly two (three) leptons of opposite charge, with transverse momentum \( P_T > 35 (25/20, \text{e/mu}) \) GeV and \( > 20 (10) \) GeV
- Trigger: double-lepton trigger (single lepton or double-lepton trigger)
- Six signal regions (according to \( M_{T2} \), dilepton invariant mass etc) are defined in two lepton final states
- Two signal regions (according to missing transverse momentum) are defined in three lepton final states

SUSY Models

Simplified Models: the masses and decay modes of the relevant particles are the only free parameters; assuming the masses of chargino \( m(C1) \) and next-to-lightest neutralino \( m(N2) \) are degenerate.

Phenomenological MSSM (pMSSM): allowing only the direct production of charginos and neutralinos via \( WW \) bosons and their decay via right-handed sleptons, gauge bosons and Higgs Bosons.

Two Lepton Final States

- Two and three leptons final states
- Diboson (WW, WZ, ZZ), top production (tt, Wt)
- Monte Carlo predictions are normalized in dedicated control regions

Three Lepton Final States

- Diboson (WZ, ZZ), top production, VVV, ttV, tZ and Higgs production
- Reducible processes via \( t \)-top production, \( WW, W+\text{jets} \) (photons), \( Z+\text{jets} \) (photons), estimated using "matrix method"

Standard Model Background

- Two lepton final states: diboson (WW, WZ, ZZ), top production (tt, Wt). The Monte Carlo predictions are normalized in dedicated control regions
- Three lepton final states: irreducible processes including diboson (WZ, ZZ), VVV, ttV, tZ and Higgs production, determined using Monte Carlo samples; reducible processes including \( t \)-top productions, \( WW, W+\text{jets} \) (photons), \( Z+\text{jets} \) (photons), estimated using "matrix method"

Interpretation of the Results

- Exclusion limits at 95% C.L. are shown in the \( m(C1), m(N1) \) plane. The dashed and solid lines show the expected and observed limits, respectively, including all uncertainties except the theoretical signal cross section uncertainties.
- The number of observed events is consistent with the Standard Model expectation in all signal regions with uncertainties.

The ATLAS Detector

- 44 m
- 25 m
- Tile Calorimeters
- PbF Calorimeters
- Muon Chambers
- Semiconductor Calorimeters
- Transition Radiation Tracker
- Semi-conductor Tracker

Results of Two Leptons Final States:

<table>
<thead>
<tr>
<th>Sample</th>
<th>( M_{T2} )</th>
<th>( m(C1) )</th>
<th>( m(N1) )</th>
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</thead>
<tbody>
<tr>
<td>( \ell^+ \ell^- )</td>
<td>130 GeV</td>
<td>100 GeV</td>
<td>90 GeV</td>
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</table>

Three Leptons Final States

- Simplified Models: the masses and decay modes of the relevant particles are the only free parameters; assuming the masses of chargino \( m(C1) \) and next-to-lightest neutralino \( m(N2) \) are degenerate.
- Phenomenological MSSM (pMSSM): allowing only the direct production of charginos and neutralinos via \( W/Z \) bosons and their decay via right-handed sleptons, gauge bosons and Higgs Bosons.

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