Search for supersymmetry in events with four or more leptons and missing transverse momentum in p-p collisions at √s=7 TeV with the ATLAS detector

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Abstract

A search for supersymmetric particles in final states with four or more leptons is presented. The analysis uses 2.06 fb⁻¹ of 7 TeV proton-proton collision data delivered by the LHC and recorded by the ATLAS detector in 2011. No significant excess above expectations from Standard Model is found. Constrains are set to an R-parity violating mSUGRA/CMSSM model. These are the first limits from the LHC experiments on a model with a as the lightest supersymmetric particle.

SUSY Models

Event Selection

Electron

Muon

SR1

SR2

≥4 leptons (electrons or muons)

E_{T\text{miss}} > 50 GeV

Z veto

* No SFOS lepton pairs with |M_{ll}-M_{Z}|<10 GeV

Results

SM Expected

1.7 ± 0.9

0.7 ± 0.8

Observed

4

0

p-value

0.10

>0.5

Upper limit on visible cross section for new phenomena is 3.5 fb (SR1) and 1.5 fb (SR2) at 95% confidence level

R-parity violating Minimal Supergravity Interpretation

SR2 is used to set limits for the mSUGRA/CMSSM scenario with m_{0}=A_{0}=0, m_{0}>0, and one R-parity lepton flavour violating parameter \lambda_{ij}=0.032 at m_{0}=400 GeV where the \tilde{\chi}_1^0 is the LSP

RPV coupling small enough that SUSY particle pair production dominates, large enough that the \tilde{\chi}_1^0 LSP decays promptly

Values of m_{0}<800 GeV are excluded at 95% CL if tanβ<40 and m_{0}>800 GeV

Corresponding to a limit on the gluino mass of 1770 GeV approximately.

BC1 benchmark point (m_{0}=400 GeV; tanβ=13)

Masses and dominant branching ratios:

<table>
<thead>
<tr>
<th>Mass [GeV]</th>
<th>Channel</th>
<th>BR</th>
<th>Channel</th>
<th>BR</th>
</tr>
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<tbody>
<tr>
<td>\tilde{\chi}_1^0</td>
<td>148</td>
<td>\tau^{+}\nu_{\tau} \rightarrow \nu^{+}\nu_{\tau}</td>
<td>50.1%</td>
<td>\tau^{-}e^{-} \rightarrow \nu^{-}e^{-}</td>
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<tr>
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<td>50.0%</td>
<td>\mu^{-}\nu_{\mu} \rightarrow \nu_{\mu}</td>
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<tr>
<td>\tilde{\chi}_1^{0}</td>
<td>161</td>
<td>\eta^{+}\eta^{-} \rightarrow \mu^{+}\mu^{-}</td>
<td>99.9%</td>
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<tr>
<td>\tilde{\chi}_1^{0}</td>
<td>162</td>
<td>\eta^{+}\eta^{-} \rightarrow \tau^{+}\tau^{-}</td>
<td>99.6%</td>
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