

## T 27: Supersymmetrie 2

Zeit: Montag 16:45–19:00

Raum: P4

T 27.1 Mo 16:45 P4

**Direct stop searches in 1 lepton final states in compressed scenarios with the ATLAS detector** — ●VAKHTANG TSISKARIDZE — Albert-Ludwigs-Universität Freiburg, Freiburg, Germany

Traditional scenarios of Supersymmetry (SUSY) are under considerable strain from tightening bounds of direct searches as well as the mass of the Higgs boson and electroweak precision data, especially when considering naturalness arguments. One way out are compressed scenarios with a small mass difference between stop ( $\tilde{t}_1$ ) and chargino ( $\tilde{\chi}_1^\pm$ ) which could have escaped detection so far at low stop masses.

This analysis searches for direct stop pair production in final states with one lepton, jets and missing transverse energy in 20.3 fb<sup>-1</sup> of data at  $\sqrt{s} = 8$  TeV  $pp$  collisions recorded by the ATLAS experiment. The neutralino ( $\tilde{\chi}_1^0$ ) is considered to be the lightest supersymmetric particle (LSP). The stop is assumed decaying to  $\tilde{t}_1 \rightarrow b + \tilde{\chi}_1^\pm$ , while the chargino to  $\tilde{\chi}_1^\pm \rightarrow W^\pm + \tilde{\chi}_1^0$  with 100% branching ratio. The produced  $b$ -jets are very soft and mainly below the  $p_T$  acceptance of the detector due to the small  $m(\tilde{t}_1) - m(\tilde{\chi}_1^\pm)$  mass difference.

To increase the acceptance compared to current ATLAS SUSY results in the 1-lepton channel, a  $b$ -jet veto is used which significantly changes the background composition. In the talk the optimization of the analysis for signals assuming gaugino universality, i.e. for  $m(\tilde{\chi}_1^\pm) = 2 \times m(\tilde{\chi}_1^0)$  are presented, together with a discussion of systematic uncertainties.

T 27.2 Mo 17:00 P4

**Neue ATLAS-Ergebnisse in der Suche nach Squarks und Gluinos in Endzuständen mit zumindest einem Lepton** — ●JEANETTE LORENZ, CHRISTOPHER BOCK, YASMINE ISRAELI, FEDERICA LEGGER, ALEXANDER MANN, LUIS SAWA, BALTHASAR SCHACHTNER, DOROTHEE SCHAILE, ALBERTO VESENTINI und JOSEPHINE WITTKOWSKI — Ludwig-Maximilians-Universität München

Gluinos and Squarks sollten reichlich bei Large Hadron Collider-Energien produziert werden, sofern sie nicht zu schwer sind. Ihr Zerfall resultiert in Ereignissen mit mehreren Jets, hoher fehlender Transversalenergie und gegebenenfalls einem oder mehreren Leptonen.

In diesem Vortrag werden aktuelle Ergebnisse in inklusiven Suchen nach solchen Ereignissen in Endzuständen mit zumindest einem isolierten Elektron oder Myon vorgestellt. Die vorgestellten Analysen verwenden den gesamten Datensatz aus 2012, aufgezeichnet vom ATLAS-Detektor, und interpretieren die Ergebnisse in einer Vielzahl von Modellen, darunter vereinfachte Modelle gleichermaßen wie verschiedene MSUGRA-Modelle.

T 27.3 Mo 17:15 P4

**Search for supersymmetry with jets, missing transverse momentum, tau leptons and one light lepton at the ATLAS detector** — PHILIP BECHTLE, KLAUS DESCH, TILL NATTERMANN, OLIVER RICKEN, STEFFEN SCHAEPE, and ●MARTIN SCHULTENS — University of Bonn

One of the major goals in the physics program of the ATLAS experiment at the Large Hadron Collider (LHC) is the search for supersymmetric extensions of the Standard Model of particle physics (SUSY). In some SUSY models multiple tau leptons can appear at the end of the decay chain of the supersymmetric particles. Hence tau leptons are an important signature for those models.

Tau leptons can either decay into hadrons or into a lighter lepton (electron or muon). Due to the big background contributions at the LHC though, pure hadronic final states are difficult to analyze. The final state with one leptonically decaying tau however, provides the opportunity for good background suppression and has promising discovery potential as well.

In this presentation recent results in the search for final states with tau leptons and one light lepton (electron or muon) will be shown. These results are based on the full 2012 LHC dataset with an integrated luminosity of 21 fb<sup>-1</sup>. They are interpreted in three different SUSY scenarios: Gauge-Mediated Supersymmetry Breaking (GMSB), Natural Gauge Mediation (NGM) and Bilinear R-Parity Violation (BRPV).

T 27.4 Mo 17:30 P4

**Search for supersymmetry with jets, missing transverse mo-**

**mentum, and two or more tau leptons with the ATLAS detector** — PHILIP BECHTLE, KLAUS DESCH, TILL NATTERMANN, OLIVER RICKEN, ●STEFFEN SCHAEPE, and MARTIN SCHULTENS — University of Bonn

With the ongoing non-discovery of SUSY, the focus of searches for physics beyond the Standard Model (SM) shifts more and more towards heavy partners of the third particle generation. Besides strongly interacting particles also scalar tau leptons play an important role either due to their mass or their couplings to other SUSY and SM particles. Moreover, only very few SM processes can produce final states containing multiple tau leptons and large missing energy.

The discovery of a Higgs Boson by ATLAS and CMS puts additional constraints on SUSY which have to be accounted for. In this analysis three different SUSY models are studied which employ very different approaches of how this is achieved.

In this talk, status and perspectives of the search for SUSY with final states containing two or more hadronically decaying tau leptons and no light leptons with the ATLAS detector will be presented.

A search for tau lepton events is performed in the full datasets of proton-proton collisions at  $\sqrt{s} = 8$  TeV recorded with the ATLAS detector. In case no excess of events will be observed above the SM prediction, 95 % confidence level upper limits will be set on the production cross section for new physics in the context of various SUSY models (GMSB, nGM, bRPV).

T 27.5 Mo 17:45 P4

**Suche nach elektroschwacher Produktion von Gauginos in Endzuständen mit Photonen und  $\cancel{E}_T$  bei CMS** — ●JOHANNES SCHULZ, LUTZ FELD und CHRISTIAN AUTERMANN — 1. Physikalisches Institut B, RWTH Aachen University

Supersymmetrische Modelle, in denen die Brechung durch Eichbosonen vermittelt wird (GMSB), sagen je nach Mischung der Gauginos Endzustände mit Photonen und Gravitinos vorher. Die nicht detektierbaren Gravitinos führen zu fehlender Energie in der transversalen Ebene des Detektors ( $\cancel{E}_T$ ). Die elektroschwache Produktion der Eichbosonen erzeugt Endzustände mit geringer hadronischer Aktivität.

Die Analyse untersucht sogenannte geparkte Daten, die 2012 bei einer Schwerpunktsenergie von 8 TeV vom CMS Detektor aufgezeichnet wurden. Geparkte Daten zeichnen sich durch geringe Triggerschwellen aus und bieten somit erhöhte Sensitivität auf elektroschwache Prozesse im Vergleich zur klassischen Analyse mit Jets. Die dominanten Standardmodell-Untergründe werden durch datengetriebene Methoden bestimmt. Prozesse geringfügigeren Beitrags werden durch Monte-Carlo Simulationen abgeschätzt. Die Selektion wird hinsichtlich der Signalprozesse durch elektroschwache Gauginoproduktion optimiert. Die untersuchten Signale werden im GMSB Modell interpretiert.

T 27.6 Mo 18:00 P4

**Measurement of the lepton-identification efficiencies for searches for Supersymmetry in events with two taus in the final state** — CHRISTOPHER BOCK, LUIS ESCOBAR, ●YASMINE ISRAELI, FEDERICA LEGGER, JEANETTE LORENZ, ALEXANDER MANN, BALTHASAR SCHACHTNER, DOROTHEE SCHAILE, ALBERTO VESENTINI, and JOSEPHINE WITTKOWSKI — Ludwig-Maximilians-Universität München

In the search for electroweak production of supersymmetric particles with the ATLAS experiment, events with two taus in the final state are investigated. The taus may decay hadronically or leptonically.

An important background to this analysis is given by events where other objects are misidentified as leptons ("fake leptons").

We report on the measurement of the probabilities for the selected leptons to be either fake or real leptons in various Standard Model processes. These probabilities can be used in the so-called "Matrix Method" to estimate the contribution of the background from fake leptons to the analysis.

T 27.7 Mo 18:15 P4

**Suche nach assoziierter Produktion von Charginos und Neutralinos in Endzuständen mit 2 Leptonen, 2 Jets und fehlender transversaler Energie am ATLAS-Detektor** — ●JOSEPHINE WITTKOWSKI, CHRISTOPHER BOCK, LUIS ESCOBAR, YASMINE ISRAELI, FEDERICA LEGGER, JEANETTE LORENZ, ALEXANDER MANN, BALTHASAR SCHACHTNER, DOROTHEE SCHAILE, ALBERTO VESENTINI, and JOSEPHINE WITTKOWSKI — Ludwig-Maximilians-Universität München

SAR SCHACHTNER, DOROTHEE SCHAILE und ALBERTO VESENTINI — Ludwig-Maximilians-Universität München

Die Wahrscheinlichkeit für die elektroschwache Produktion nicht-farbgeladener supersymmetrischer Elektroweakinos in Proton-Proton-Kollisionen ist relativ hoch, wenn Gluinos und Squarks sehr schwer sind. Ein Paar aus Chargino-1 und Neutralino-2 kann dann über ein Standardmodell-Higgs-Boson und ein  $W$ -Boson zerfallen. Nach dem Zerfall des Higgs-Bosons in zwei  $W$ -Bosonen enthält der Endzustand zwei Leptonen mit gleichem Ladungsvorzeichen, zwei Jets sowie nicht detektierbare Teilchen.

Der dominante Untergrund für diese Signatur sind durch QCD produzierte Jets, die als Leptonen fehlidentifiziert wurden. Die Zerfälle von  $WZ$  oder  $WW$ -Bosonenpaaren können ebenfalls zwei Leptonen und zwei Jets als Signatur aufweisen. Der Beitrag dieser Standardmodell-Prozesse zu der Anzahl selektierter Ereignisse wird durch die geschickte Wahl von Schnitten auf kinematische und geometrische Variablen verringert. Die Sensitivität auf supersymmetrische Ereignisse in ATLAS-Daten wird durch die entsprechende Optimierung der Signalregionen maximiert.

T 27.8 Mo 18:30 P4

**Search for SUSY Light sparticles in Vector Boson Fusion processes with two like sign Taus** — DANIELE MARCONI, DENIS RATHJENS, CHRISTIAN SANDER, and LUKAS VANELDEREN — Universität Hamburg

The LHC has placed bounds on the masses of gluino and 1st/2nd generation squarks of the order of 1 TeV. On the other hand, the bounds on the SUSY partners of electroweak gauge bosons and leptons are less stringent. These bounds, combined with the cosmologically favoured stau-neutralino coannihilation region, points to SUSY models

with light 3rd generation particles and light charginos/neutralinos. The production of sleptons and EWKinos via Vector Boson Fusion (VBF) offers a promising avenue to study the non colored sectors of SUSY. Taking advantage of kinematic properties of the backward-forward jets, produced in VBF processes it is possible to reduce the background of Standard Model processes with rather loose selection of the "central" part of the event

We present a search for EWKinos and sleptons produced in VBF processes in same sign taus final states. The data sample corresponds to an integrated luminosity of  $20 \text{ fb}^{-1}$  of pp collisions at  $\sqrt{s} = 8 \text{ TeV}$  collected with the CMS detector.

T 27.9 Mo 18:45 P4

**Search for Resonant Production of Second Generation Sleptons in RPV Supersymmetry at  $\sqrt{s} = 8 \text{ TeV}$  with the CMS Experiment** — MARKUS RADZIEJ, MATTHIAS ENDRES, ANDREAS GÜTH, THOMAS HEBBEKER, ARND MEYER, LARS SONNENSCHNEIN, DANIEL TEYSSIER, SEBASTIAN THÜER, and MARTIN WEBER — III. Physikalisches Institut A, RWTH Aachen

The topic of this talk is the search for resonant production of second generation sleptons, which decay into a final state of two muons and two jets. Such processes can only occur in supersymmetric models where  $R$ -parity is violated. While the latter is often assumed to be conserved to prevent e.g. proton decay, other local gauge symmetries such as baryon triality can also ensure a stable proton.

While many Standard Model processes can lead to a dimuon final state, they usually do not offer the possibility for the leptons to have the same charge. Requiring this allows for a tremendous improvement of the signal to background ratio. The results shown are based on the 2012 data taking period of the CMS experiment, which operated at a center-of-mass energy of  $\sqrt{s} = 8 \text{ TeV}$ .