T 18: Beyond the Standard Model (Theorie) II

Convenor: Margarete Mühlleitner

Zeit: Dienstag 16:45–19:00 Raum: HG XIV

T 18.1 Di 16:45 HG XIV

Light charged Higgs in the NMSSM — •Lisa Zeune[1], Oscar Stal[2], Johan Rathsman[2], and Gunnar Ingelman[2] — [1]II. Physikalisches Institut Universit"at G"ottingen — [2]High-Energy Physics, Dept. of Physics and Astronomy, Uppsala University

The observation of a charged scalar particle would be the clear proof of physics beyond the standard model. But the experimental signature - and related to this the needed search strategy - is highly dependent of the assumed model.
The next-to-minimal supersymmetric standard model (NMSSM) is an attractive extension of the MSSM, that differs from MSSM by the introduction of a singlet superfield. Some of the shortcomings like the μ-problem of the MSSM are solved naturally in the NMSSM. The additional singlet field leads to an extended Higgs sector. In the NMSSM the phenomenology of the charged Higgs boson differs considerably from its phenomenology in the minimal model with only two Higgs doublets.
A study about light charged Higgs bosons in the NMSSM with focus on the region with a charged Higgs mass below the MSSM lower bound of around 120 GeV is presented. Beside all theoretical constraints and constraints from collider searches, flavor physics constraints are applied to find allowed points in the parameter region yielding a light charged Higgs boson. Further the decays of light charged Higgs are studied and detection prospects at the LHC are discussed.

T 18.2 Di 17:00 HG XIV

Missing Mass at the LHC — •Bob McElrath — Heidelberg University

T 18.3 Di 17:15 HG XIV

Gluino Polarization at the LHC — Michael Krämer[1], •Eva Popenda[2], Michael Spira[3], and Peter Zerwas[1,4] — [1]Institut für Theoretische Physik E, RWTH Aachen University, Aachen, Germany — [2]Institut für Theoretische Physik, KIT, Karlsruhe, Germany — [3]Paul Scherrer Institut, Villigen, Switzerland — [4]Deutsches Elektronen-Synchroton DESY, Hamburg, Germany

The Minimal Supersymmetric Standard Model [MSSM] predicts the copious production of gluinos at the LHC: Gluino pairs in quark-antiquark and gluon-gluon collisions $q\bar{q}, gg \to \tilde{g}\tilde{g}$ and single gluinos in association with squarks in the super-Compton process $qg \to \tilde{q}\tilde{g}$. While the contribution of the individual polarization of gluinos in gluino pair production can be neglected when the mass difference between L and R squarks of the first two generations is small, the spin-spin correlations within gluino pairs and the gluino polarization in single gluino production are predicted to have sizable effects on the cross sections. The subsequent gluino decay into quarks and squarks is sensitive to the gluino spin, so that final-state distributions of the decay chains are affected by the polarization of the gluinos. We analyze the impact of gluino polarization on invariant di-jet masses in reconstructed final states.

T 18.4 Di 17:30 HG XIV

Spin Discrimination in Three-Body Decays — •Lisa Edelhäuser, Werner Porod, and Ritesh K. Singh — Uni Würzburg

We investigate three-body decays $X \to f\bar{f}Y$ with a very heavy intermediate particle. For these decays we develop a model-independent strategy to determine the spins of the decaying particle X and the invisible daughter particle Y if the invariant mass distribution of the fermions m^2_{ff} can be reconstructed. We calculate the generic decay rate in terms of m^2_{ff} for different spin assignments to X and Y and rewrite it as polynomials with coefficients depending on the masses and generic couplings of the underlying process. We demonstrate that with the help of these coefficients it is possible to support or exclude a specific spin assignment of the two unknown particles.

T 18.5 Di 17:45 HG XIV

Collider Signatures of Minimal Flavor Mixing from Stop Decay Length Measurements — Gudrun Hiller, Jong Soo Kim, and •Henning Sedello — Institut für Physik, TU Dortmund, D-44221 Dortmund

The prospects to extract supersymmetric FCNC couplings from the measurement of the decay length of a light and long-lived stop at the LHC are investigated.

T 18.6 Di 18:00 HG XIV

LHC-Phenomenology of Leptoquarks in a SUSY GUT — •Daniel Wiesler and Jürgen Reuter — Hermann-Herder-Str. 3, Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

We present the LHC-phenomenology of exotic scalar leptoquarks and fermionic leptoquarkinos in context of an E_6 SUSY GUT. Feynman rules for the interaction of these exotics were derived and implemented into the Monte-Carlo event generator WHIZARD. The Production mechanisms are investigated and the corresponding cross-sections are calculated using WHIZARD and cross-checked with earlier studies. Exclusive final states for LHC searches for scalar leptoquarks are classified and cuts are developed with respect to the optimization of signal- to-background ratios. In the fermionic leptoquarkino sector we introduce a method to measure mass differences for sparticles and apply it to our specific scenario. The resulting mass edges substantially differ from the usual SUSY ones in the literature and can provide an insight into the underyling (SUSY-) GUT. Assuming an additional flavour symmetry, striking OSDF lepton contributions from scalar leptoquarks allow for spectacular signatures at the LHC and can serve as remnants of high-scale flavour physics.

T 18.7 Di 18:15 HG XIV

Electroweak corrections in supersymmetric models with broken R-parity — •Stefan Liebler — Institut für Theoretische Physik und Astrophysik, Universität Würzburg, D-97074 Würzburg

Supersymmetric models with broken R-parity provide an interesting alternative ansatz to explain neutrino physics, which is intrinsically supersymmetric. In most of these models one has to calculate the neutrino mass matrix at the one loop level to be consistent with current neutrino data. It turns out that also the one loop electroweak corrections to the decays of the lightest supersymmetric particle are important. Those show interesting correlations with the neutrino mixing angles, which can be tested at the LHC.

T 18.8 Di 18:30 HG XIV

Collider Signatures with a decaying selectron/smuon-LSP in RPV mSUGRA — •Tim Stefaniak[1,2] and Herbi Dreiner[2] — [1]Universität Göttingen — [2]BCTP Bonn

In R-parity violating supersymmetry the LSP may in principle have charge and/or flavor. I explore possible scenarios with a selectron/smuon-LSP within the RPV-mSUGRA model. The LSP decays in the detector. I shall present the relevant collider signatures. A promising search strategy for the LHC would be a trilepton analysis which I will present in detail.

T 18.9 Di 18:45 HG XIV

R-Paritäts-Verletzung, Gravitino LSP und Stau-Zerfälle — •Sergei Bobrovskyi, Wilfried Buchmüller, Jan Hajer und Jonas Schmidt — DESY, Hamburg

Aus theoretischer Sicht sind supersymmetrische Modelle mit und ohne R-Parität gleichwertig. Ohne die R-Parität kann das leichteste supersymmetrische Teilchen (LSP) zerfallen und trägt nur unter Umständen zur Dunklen Materie bei.

Hier wird ein neues supersymmetrisches Szenario mit R-Paritäts-Verletzung vorgestellt, bei dem der Superpartner des Gravitons, das Gravitino, das LSP ist. Die kosmologischen Einschränkungen an die Parameter der R-Paritäts-Verletzung führen zu einer Lebensdauer des Gravitinos, die größer ist als das Alter des Universums. Das Gravitino ist somit ein Kandidat für die Dunkle Materie. Die vorhergesagten Gravitino-Zerfälle könnten als eine Quelle der hochenergetischen kosmischen Strahlung registriert werden. Zu den Vorzügen des Modells gehört ausserdem die Konsistenz mit der thermalen Leptogenese bei hoher Temperatur und den Einschränkungen aus der primordialen Nukleosynthese.

Aufgrund der R-Paritäts-Verletzung kann das nächst leichteste supersymmetrische Teilchen (NLSP) direkt in Teilchen des Standardmodells zerfallen und unter Umständen zu spektakulären Spuren in den LHC Detektoren führen.