T 38: Interpretation von SUSY Suchen (Theorie/Experiment)

Zeit: Montag 16:45–19:05 Raum: P104

Gruppenbericht T 38.1 Mo 16:45 P104

(Re-)interpreting ATLAS searches for supersymmetry in R-parity violating models — •Michael Flowerdew[1], Maximilian Goblirsch-Kolb[1], Dominik Krauss[1], Hubert Kroha[1], Johannes Mellenthin[1], Andreas Redelbach[2], and Manuel Schreyer[2] — [1]Max-Planck-Institut für Physik, München — [2]Universität Würzburg

The high-dimensional parameter space of supersymmetric (SUSY) models presents a significant problem in designing and interpreting the results of collider searches. If the assumption of R-parity conservation is dropped, the introduction of 48 new parameters exacerbates this problem. Typically, analysis optimisation and interpretation is made tractable by the use of constrained models, phenomenological models and simplified models. In this talk, we review the different approaches used in searches for R-parity violating SUSY in ATLAS, and discuss strategies for further reinterpretation of these results with a view to improving the search strategies for Run 2.

T 38.2 Mo 17:05 P104

Development and Analysis of Simplified Models in the Search for Supersymmetry with Tau Leptons in the Final State at the ATLAS Experiment — Philip Bechtle, Klaus Desch, Till Nattermann, •Oliver Ricken, Steffen Schaepe, and Martin Schultens — University of Bonn

A recently pursued approach in the search for Supersymmetry (SUSY) as an extension of the Standard Model is the exploitation of so-called Simplified Models. While the search for full SUSY models requires the investigation of all possible decay topologies the model allows for, the search exploiting Simplified Models can be reduced to a single decay topology. As a consequence, Simplified Models offer a rather easily accessible but reduced parameter space to parametrise the outcome of SUSY searches. Simplified Models could provide hints where to look for SUSY using full model analyses and set limits on model parameters.
This talk introduces a recently developed Simplified Model of strong squark production along with two auxilliary models of electroweak processes. For the primary model and one auxilliary model the obtained exclusion limits on the model parameters are presented and discussed. Moreover, the results of detailled analyses regarding dominant and subdominant parameters of the primary model studied in the two auxilliary models are shown. Motivated by these studies, the development and prospects of optimal parametrisation of future Simplified Models of strong production is addressed.

T 38.3 Mo 17:20 P104

SUSY Simplified Model Limits on Universal Extra Dimension Models — Lisa Edelhäuser, Michael Krämer, and •Jory Sonneveld — RWTH Aachen

To interpret searches for supersymmetry (SUSY) in terms of more general models instead of more constrained SUSY models, the ATLAS and CMS collaborations at the LHC quantify their search results in terms of simplified models, augmenting the spectrum of the standard model with a few hypothetical new particles. As these particles are often SUSY particles, one may ask how these results could be used to constrain other models of physics beyond the standard model (BSM).

In our work presented here, we discuss the usability of simplified SUSY models to estimate limits on a non-SUSY BSM model. We focus on a Universal Extra Dimensions model in order to quantify spin effects and test the interpretation of limits from simplified models in this context. For this purpose we use all-hadronic (multijet plus missing transverse energy) supersymmetry searches.

T 38.4 Mo 17:35 P104

Constrained SUSY after the Higgs discovery — •Björn Sarrazin for the Fittino-Collaboration — Physikalisches Institut, Bonn University, Germany

The non-observation of SUSY at the LHC and the discovery of a Higgs Boson with a mass of about 125 GeV together with results from low energy measurements and cosmology have put constrained supersymmetry under pressure. Performing global fits with the framework Fittino we find that the fit quality of the CMSSM is still in a well acceptable range, when Higgs mass and rate measurements at the LHC are taken into account. For the first time, we perform toy fits to calculate p-values of the CMSSM. Toy fits are also used to get estimations of the allowed ranges of parameters and observables in this model, in addition to the well-established profile likelihood technique.

T 38.5 Mo 17:50 P104

Physics beyond the Standard Model and Higgs fits with Fittino — •Alexander Knochel for the Fittino-Collaboration — RWTH Aachen

After the discovery of the new Higgs-like Boson at the LHC, we can now search for deviations from Standard Model predictions in processes involving the production of the new particle. In this talk, I discuss the parametrization of BSM physics via higher-dimensional operators, existing theoretical and phenomenological constraints as well as their impact on LHC phenomenology. I describe our implementation of this effective theory framework into Fittino allowing a systematic study of the experimental constraints, and present first results.

T 38.6 Mo 18:05 P104

Phenomenological MSSM interpretation of the CMS 7 and 8 TeV results — •Lukas Vanelderen, Christian Sander, and Teresa Lenz — University of Hamburg, Germany

We interpret within the phenomenological MSSM (pMSSM) results from searches for new physics performed by CMS in pp data sets collected at 7 TeV and 8 TeV, corresponding to integrated luminosities of 5 fb^{-1} and 19.5 fb^{-1}, respectively. The pMSSM is a 19-parameter realisation of the MSSM, defined at the SUSY scale, that captures most of the features of the general R-parity conserving weak-scale MSSM. It allows us to draw conclusions that are more generic, and therefore more robust, than those derived in more constrained models, including simplified models and those that impose particular SUSY breaking schemes, such as the CMSSM. We perform a global Bayesian analysis on a data set, which in addition to CMS search results, includes data from pre-CMS and indirect measurements. We study posterior probability densities of model parameters, masses and observables and study implications for the MSSM Higgs sector and dark matter searches. Our study provides a coherent global picture of how the current CMS searches constrain supersymmetry in general.

T 38.7 Mo 18:20 P104

Auswirkungen eines 126 GeV Higgs auf die Neutralino Masse — •Conny Beskidt[1], Wim de Boer[1] und Dmitri Kazakov[1,2] — [1]Karlsruhe Institute of Technology (IEKP), Karlsruhe, Germany — [2]JINR, ITEP, Moscow, Russia

Wir diskutieren den Einfluss eines 126 GeV Higgs auf die direkte und indirekte Dunkle Materie Suche, wie beispielsweise Massenspektren und die dominanten Dunkle Materie Annihilationssignaturen, sowohl für das CMSSM (Constrained Minimal Supersymmetric Model) als auch das NMSSM (Next-to-Minimal Supersymmetric Model). Letzteres Modell beinhaltet ein zusätzliches Singlet, welches die Higgs Masse erhöht, so dass eine Masse von 126 GeV erreicht wird ohne dabei Stops zu benötigen, die mehrere TeV schwer sind wie im CMSSM. Innerhalb des NMSSM liegt das WIMP typischerweise unterhalb von 100 GeV und ist dabei hauptsächlich eine Higgsino-Singlino Mischung, während im CMSSM das WIMP eine Bino Natur aufweist und somit problemlos im TeV Bereich liegen kann. Für beide Modelle kann die korrekte Reliktdichte erreicht werden, jedoch für unterschiedliche Werte von tanbe: während im CMSSM grosse Werte von tanbe (> 50) benötigt werden, sind im NSSM schon kleine Werte von tanbe möglich.

T 38.8 Mo 18:35 P104

Light Higgsino Precision Measurements at the International Linear Collider — Mikael Berggren[1], Felix Brümmer[1], Jenny List[1], Gudrid Moortgat-Pick[2], Tania Robens[3], Krzysztof Rolbiecki[4], and •Hale Sert[1,2] — [1]DESY, Notkestraße 85, 22607 Hamburg, Germany — [2]Physics Department, University of Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany — [3]IKTP, TU Dresden, Zellescher Weg 19, 01069 Dresden, Germany — [4]IFT-UAM/CSIC, C/Nicolás Cabrera 13-15, 28049 Madrid, Spain

In this talk, a study based on Natural SUSY will be presented. Key predictions of Natural SUSY are three light, almost mass degenerate higgsinos, with mass splittings of a few GeV or even less. The main goal of this study is to estimate the achievable precision on the hig-

gsino masses, mass differences and cross sections at the International Linear Collider. For this, we assume a particularly challenging scenario in which all other SUSY particles apart from the higgsinos are very heavy up to the multi-TeV regime. The higgsinos can be produced via $e^+e^- \to \tilde{\chi}_1^+\tilde{\chi}_1^-\gamma$ and $e^+e^- \to \tilde{\chi}_2^0\tilde{\chi}_1^0\gamma$, where the photon is required to suppress the Standard Model backgrounds. They decay according to $\tilde{\chi}_1^\pm \to \tilde{\chi}_1^0 W^{*\pm}$, $\tilde{\chi}_2^0 \to \tilde{\chi}_1^0 Z^{*0}$ and $\tilde{\chi}_2^0 \to \tilde{\chi}_1^0\gamma$, where we chose exclusive decay modes to separate the charged and neutral higgsinos. We present an analysis based on fast simulation of ILD detector concept and show that the relevant SUSY parameters can be determined from the measured observables.

T 38.9 Mo 18:50 P104

Natural SUSY with higgsino LSP — •Lukas Mitzka — Institut für Theoretische Physik und Astrophysik, Universität Würzburg, Würzburg, Germany

We investigate scenarios within Natural SUSY with stops, sbottoms and higgsinos, which are the lightest neutralinos and charginos. We study how much the data of the 8 TeV third generation searches at the LHC can possibly constrain this scenario. For this we perform a scan of the parameter space using Monte Carlo simulations of all relevant LHC processes including a detector simulation.