T 77: Jenseits des Standardmodells (Theorie) 2

Zeit: Mittwoch 16:45–19:00 Raum: P6

T 77.1 Mi 16:45 P6

Precise predictions for Higgs-masses in the Next-to-Minimal Supersymmetric Standard Model (NMSSM) — •Peter Drechsel and Georg Weiglein — DESY, Notkestraße 85, 22607 Hamburg

The NMSSM represents an elegant and well motivated alternative description for the observed phenomenology in high energy physics. In this theory a scalar singlet together with its superpartner is added to the Higgs-sector of the Minimal Supersymmetric Standard Model (MSSM). In order to allow significant testing of the NMSSM by experiments precise predictions for the parameters of the theory are a necessity.

The talk will focus on the prediction for the Higgs-masses in the NMSSM at 1-loop order obtained by diagrammatic methods (the dominant 2-loop corrections will be implemented as a further step in the project). It will also provide some insights into the basic principles of the calculation, especially the renormalization of softly broken supersymmetric gauge theories.

T 77.2 Mi 17:00 P6

Higher Order Corrections to the Trilinear Higgs Self-Couplings in the Real NMSSM — Dao Thi Nhung, Margarete Mühlleitner, •Juraj Streicher, and Kathrin Walz — Institut für Theoretische Physik, Karlsruher Institut für Technologie

The pursuit of future LHC analyses is the determination of the properties of the observed Higgs boson candidate. Apart from the comparison to the Standard Model (SM) predictions, it is also important to clarify whether the candidate might be a Higgs boson of an extension beyond the SM. Among these, the Next-to-Minimal Supersymmetric Extension of the SM (NMSSM) yields interesting consequences for the Higgs phenomenology due to its enlarged Higgs sector consisting of seven Higgs bosons. The knowledge of higher order corrections to the Higgs boson masses and couplings is indispensable in order to obtain theoretical predictions competing with experimental precision. The latter is mandatory to be able to distinguish between different models. After having provided the one-loop corrections to the Higgs boson masses in previous works, we now present the one-loop corrected trilinear self-couplings of Higgs bosons in the CP conserving NMSSM and discuss the impact of these corrections in some sample scenarios compatible with the current LHC data. The corrections substantially alter the decay widths of Higgs-to-Higgs decays and the cross sections of Higgs pair production in gluon fusion.

T 77.3 Mi 17:15 P6

Two-Loop Contributions of the Order $\mathcal{O}(\alpha_s\alpha_t)$ to the Masses of the NMSSM Higgs Bosons — Margarete Mühlleitner[1], Heidi Rzehak[2], Nhung Thi Dao[1], and •Kathrin Walz[1] — [1]Institute for Theoretical Physics, Karlsruhe Institute of Technology — [2]Physikalisches Institut, Albert-Ludwigs-Universität Freiburg

The Higgs sector of the Next-to Minimal Supersymmetric Extension of the Standard Model features five neutral Higgs bosons. Compared to the MSSM it is extended by one additional complex singlet field.

After the discovery of a Higgs-like boson at the LHC it is important to have accurate phenomenological predictions available for the different models in order to discuss them in light of the experimental results.

We contribute to this effort by calculating the two-loop contributions of the order $\mathcal{O}(\alpha_s\alpha_t)$ in the approximation of vanishing external momentum to the masses of the neutral Higgs bosons in the framework of the NMSSM. We employ a renormalization scheme that mixes on-shell and $\overline{\text{DR}}$ renormalization conditions matching those we used in our previous one-loop calculation.

T 77.4 Mi 17:30 P6

The Higgs sector of an R-symmetric supersymmetric model — •Philip Diessner[1], Jan Kalinowski[2], Wojciech Kotlarski[2], and Dominik Stöckinger[1] — [1]IKTP, TU Dresden, Germany — [2]Universität Warschau, Polen

R-Symmetry in an additional symmetry which can be imposed on an supersymmetric model. In the Minimal R-Symmetric Supersymmetric Standard Model (MRSSM) this symmetry is incorporated and leads to interesting phenomenological consquences like the prediction of Dirac Gauginos. Because of an extended Higgs sector, it is not immediately clear that the observation of a Higgs boson at the LHC with a mass of around 125 GeV can be explained in the same way as in the MSSM.

In this talk, an analysis of the Higgs sector of the MRSSM will be presented, deriving bounds on the parameters of the model. I will focus on scenarios, where a lightest Higgs with a mass of around 125 GeV is possible. Also, differences and similarities of the MRSSM to the MSSM will be discussed.

T 77.5 Mi 17:45 P6

Distinction between NMSSM and MSSM in challenging scenarios at LHC and ILC — •Stefano Porto[1], Gudrid Moortgat-Pick[1,2], and Krzysztof Rolbiecki[3] — [1]Universität Hamburg, Germany — [2]DESY, Hamburg, Germany — [3]Universidad Autonoma de Madrid, Spain

Supersymmetry offers appealing answers to several Standard Model shortcomings, such as Dark Matter origin, Naturalness, gauge coupling unification. In case of discovery of supersymmetric particles at colliders, the challenge would then be to understand the underlying supersymmetric realization that describes the observed new physics. After the Higgs discovery at the LHC, constrained and simplified SUSY models are under pressure. However, both minimal supersymmetric Standard Model (MSSM) and next-to-minimal supersymmetric Standard Model (NMSSM) offer large regions in the parameter space to be explored. It is therefore essential to find strategies to discriminate between these two models. In fact, they can lead to similar Higgs sectors that are hardly distinguishable both at the LHC and at the ILC and very close lower supersymmetric mass spectra. We study the tricky possibility of detecting only the lightest neutralinos and chargino that can be ascribed both to the MSSM and the NMSSM. We develop discrimination tools that exploit the power of polarised beams at the ILC in an interplay with the higher energies reached at the LHC. Applying SUSY parameter determination fits together with polarization techniques, we highlight neutralino gauge eigenstate admixtures, that are generally different between the two models, enabling their distinction.

T 77.6 Mi 18:00 P6

FlexibleSUSY – A spectrum generator generator for supersymmetric models — •Alexander Voigt — TU Dresden

In this talk the general spectrum generator framework FlexibleSUSY is presented. FlexibleSUSY provides Mathematica meta code to create custom spectrum generators for non-minimal supersymmetric models. Its main design goals are modularity (via C++ object orientation) and speed.

T 77.7 Mi 18:15 P6

Reviving minimal left-right supersymmetry in the light of LHC data — Adam Alloul[1], Lorenzo Basso[2,3], Benjamin Fuks[2,4], •Manuel E. Krauss[5], and Werner Porod[5] — [1]IUT Colmar, France — [2]Université de Strasbourg, France — [3]Universität Freiburg, Germany — [4]CERN, Geneva, Switzerland — [5]Universität Würzburg, Germany

We investigate a supersymmetric left-right model based on the gauge group $SU(3)_c \times SU(2)_L \times SU(2)_R \times U(1)_{B-L}$ in which the Higgs sector consists of bidoublets, triplets and a singlet under the two $SU(2)$ groups. It is minimal in the sense that R-parity is conserved. New resonances are expected from the extra gauge bosons Z_R and W_R due to the enlarged gauge sector. We show how the experimental bounds on the W_R are affected by open additional decay channels into supersymmetric particles. Moreover, right-handed neutrinos can easily escape current searches due to the presence of a possibly light charged Higgs boson.

T 77.8 Mi 18:30 P6

New Physics Contributions to the Top Quark Charge Asymmetry in Hadronic Collisions — •Peter Galler, Erik Matiske, and Peter Uwer — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstraße 15, D-12489 Berlin

The forward-backward charge asymmetry (FBA) in $t\bar{t}$ production is measured by the CDF collaboration at the TEVATRON with a discrepancy of about 2.0 standard deviations with respect to the Standard Model prediction. Scalars in different representations of the SU(3) color

gauge group that couple top quarks to light quarks have been investigated as a source of this non-standard FBA. Because of its symmetric setup the LHC cannot measure the FBA directly. However if scalars in certain color representations exist then they can be found at the LHC or limits on their couplings can be set. The coupling strength and mass parameter space of these scalars is constrained to some extend by the CDF measurement. Considering these bounds we investigate further constraints from various LHC observables.

T 77.9 Mi 18:45 P6

Search for dark matter at the LHC and with astrophysical experiments — •Leila Ali Cavasonza and Michael Kraemer — RWTH Aachen, Germany

The search for new physics beyond the Standard Model is one of the central goals of current and future experiments in particle and astroparticle physics. A particularly exciting challenge is the exploration of the nature of dark matter. Weakly interacting massive particles (WIMPs) are predicted in many well-motivated extensions of the Standard Model, like SUSY, and provide a natural candidate for cold dark matter. Searches for WIMPs can be carried out at colliders, in the framework of a concrete model, and through direct and indirect detection. A particularly exciting aspect of current and future searches is the complementarity of these different search methods. In indirect detection one searches for dark matter annihilation products which would produce secondary antimatter particles like positrons or anti-protons in cosmic rays. Such antimatter particles can be detected with the AMS experiment, which is currently taking data on the International Space Station ISS. AMS is measuring various spectra on antimatter particles with unprecedented precision and thus offers new opportunities to detect dark matter or exclude certain regions of the parameter space of new physics models. In this context we investigate the interplay between LHC searches for dark matter and the potential for indirect dark matter detection with the AMS experiment, to obtain new constraints on the SUSY parameter space or on more general new physics models, proposed in the literature.