# T 16: Beyond the Standard Model (Theorie) 2
Convenor: Jürgen Reuter

Zeit: Dienstag 16:45–18:45                                                      Raum: VG 3.102

**T 16.1  Di 16:45  VG 3.102**
**Higgs Self-Couplings in the MSSM** — •Mathias Brucherseifer and Michael Spira — PSI, Villigen, Schweiz

The Higgs sector in the MSSM is known to receive large radiative corrections at one-loop level, coming from top and stop loops. The $\mathcal{O}(\alpha_s\alpha_t+\alpha_t^2)$ two-loop radiative corrections to the MSSM Higgs masses and self-couplings can be determined by the effective potential method, which is equivalent to the exact diagrammatic result in the limit of vanishing external momenta. This talk will cover a review about the effective potential method applied to the MSSM Higgs sector and its renormalization at two-loop order. Numerical results for the self-couplings and their scale- and renormalization-scheme-dependence will be discussed.

**T 16.2  Di 17:00  VG 3.102**
**Higgs pair production in a Composite Higgs model and the effects of heavy fermions** — Jose R. Espinosa[1,2], •Ramona Grober[3], Christophe Grojean[4,5], Margarete Muhlleitner[3], and Ennio Salvioni[4,6] — [1]ICREA, Institucio Catalana de Recerca i Estudis Avancats, Barcelona, Spain — [2]IFAE, Univeritat Autonoma de Barcelona, Barcelona, Spain — [3]Institut fuer Theoretische Physik, Karlsruhe Institute of Technology, Karlsruhe, Germany — [4]CERN, Theoretical Physics, Geneva, Switzerland — [5]Institut de Physique Theorique, CEA Saclay, Gif-sur-Yvette, France — [6]Dipartimento di Fisica and INFN, Universita di Padova, Padova, Italy

In composite Higgs models the Higgs boson arises as a pseudo Nambu-Goldstone boson of an enlarged global symmetry. If the Higgs boson is a composite state of a strongly interacting sector, the large top mass can be explained by partial top compositeness which means that the top mass arises through an admixture of the top quark with states from the composite sector. For single Higgs production via gluon fusion it was shown in several papers that the masses of top partners have no effect on the cross section. We will show here that this does not hold true for Higgs pair production. There the cross section depends on the specific choice of the model parameters.

**T 16.3  Di 17:15  VG 3.102**
**Masses of the Neutral Higgs Bosons at One-Loop Level in the NMSSM** — •Kathrin Ender[1], Thorben Graf[2], Ramona Gröber[1], Margarete Mühlleitner[1], and Heidi Rzehak[3] — [1]TP, Karlsruhe Institute of Technology — [2]IPPP, University of Durham — [3]CERN, Theory Divison

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. In order to distinguish the Higgs sectors of the different models in the Higgs searches, it is important to have accurate phenomenological predictions available. We contribute to this effort by presenting the full one-loop calculation of the masses of the neutral Higgs bosons in the framework of the NMSSM. We employ a renormalization scheme that mixes on-shell and $\overline{\mathrm{DR}}$ renormalization conditions, which originate from the Higgs sector, as well as from the neutralino and chargino sectors, and thereby provide a nontrivial cross-check.

**T 16.4  Di 17:30  VG 3.102**
**Unitarity in weak-boson scattering: Spin-0, spin-1 or spin-2 resonances?** — •Jessica Frank, Franziska Schissler, and Dieter Zeppenfeld — IThP, Karlsruhe Institute of Technology, 76128 Karlsruhe, Germany

In the Standard Model, the unitarity of the S-matrix in weak-boson scattering is preserved by the Higgs boson. Higgsless models have to provide an alternative to restore the unitarity of weak-boson scattering amplitudes, which otherwise grow with the center-of-mass energy, eventually violating unitarity.

In this talk, we investigate to what extent new spin-1 or spin-2 resonances can delay this problem. Thereby, we focus on fermiophobic spin-1 resonances, working in a model-independent approach which is based on sum-rules. We find that light spin-1 resonances can preserve unitarity in the elastic scattering channels. Furthermore, we briefly discuss the unitarity of inelastic channels with these new spin-1 particles in the final state.

**T 16.5  Di 17:45  VG 3.102**
**SUSY-Backgrounds to Searches of the Neutral Higgs Boson** — •Bastian Feigl[1], Heidi Rzehak[2], and Dieter Zeppenfeld[1] — [1]TP, Karlsruhe Institute of Technology, Karlsruhe, Germany — [2]CERN Theory Division, Geneva, Switzerland

Searches for neutral Higgs bosons may suffer from additional background contributions due to processes involving SUSY particles. Especially the decay products of gauginos and sleptons can mimic the leptonic signature $l^+l^- + p\!\!\!/_T$ of a Higgs boson decaying into $W^+W^-$ or, to a lesser extent $\tau^+\tau^-$.

We analyze those contributions within the Minimal Supersymmetric Standard Model (MSSM). We present differential cross sections and give an estimate of the impact on the Higgs boson searches in the gluon fusion and vector boson fusion channels.

**T 16.6  Di 18:00  VG 3.102**
**Search for NMSSM Higgs bosons at the LHC** — •Lukas Mitzka — Institut für Theoretische Physik und Astronomie, Universität Würzburg

The NMSSM contains gauge singlet-like Higgs bosons, whose direct production is strongly suppressed. We consider a framework with mSUGRA-like boundary conditions and study cascade decays of supersymmetric particles containing such Higgs bosons. We show that in certain regions of the parameter space these states can be discovered at the LHC in this way.

**T 16.7  Di 18:15  VG 3.102**
**Impact of LHC search results on the W mass prediction in supersymmetric models** — •Lisa Zeune and Georg Weiglein — DESY, Hamburg, Germany

Electroweak precision observables, such as the W boson mass, are highly sensitive to quantum corrections of New Physics. Thus they provide a powerful tool to test and constrain extensions of the Standard Model. To fully exploit the experimental accuracies, provided by current and future collider experiments, precise theory predictions are necessary. We present results for $M_W$ in the MSSM and the NMSSM, including the known higher order corrections, and discuss the implications of LHC searches on the $M_W$ prediction in minimal and non-minimal SUSY models.

**T 16.8  Di 18:30  VG 3.102**
**Interpretation of LHC Higgs search results in supersymmetry** — •Oscar Stal — DESY, Hamburg

With 5 fb$^{-1}$ the LHC experiments have already delivered strong constraints on the presence of a Higgs boson with SM properties, limiting the allowed mass range to a narrow window of about 114 GeV < MH < 130 GeV. We consider different interpretations of these results in the minimal and next-to-minimal supersymmetric extensions of the Standard Model, and discuss the implications for future searches.